FETATRACK 210 & 260 SERIES FETAL MONITORING

SYSTEMS SERVICE MANUAL

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SECTION 1

GENERAL INTRODUCTION

1.0 INTRODUCTION

This service manual is written to aid in the maintenance and repair of the FETATRACK 210 and FETATRACK 260 series Fetal Monitors. Servicing of this equipment should be performed only by a qualified technician after carefully studying this manual.

Section 7 of this manual describes safety checks for this instrument. All monitors are thoroughly checked according to these instructions prior to shipment, but routine scheduled safety checks are strongly encouraged to ensure the equipment continues to meet the specifications for safety.

The drawings and circuit descriptions in this manual are correct as of the date it was assembled, but the manufacturer reserves the right to make changes to improve the operation of the instrument. If your instrument does not exactly match the manual, contact the manufacturer for revision information.

1.1 UNPACKING

Inspect the instrument upon receipt for damage, dents, or scratches. If damage is found notify SEWARD LTD promptly at the following address:-

Seward Ltd
98 Great North Road
London
N2 0GN
United Kingdom

Telephone +44 (0) 181 365 4115

FAX +44 (0) 181 365 3999

Retain the packing material for possible future use.

The instrument is set to operate at a nominal voltage of 240 VAC or 110 VAC 50/60 Hz according to the destination.
If you have any doubt as to the voltage setting of your unit consult Seward immediately for advice. Be prepared with the unit serial number.
In the event that the instrument must be returned to Seward for service, or any other reason, use the same packing material in which the instrument was delivered. If this is no longer available, the instrument should be packaged in a strong box of suitable size and with adequate protective padding.

1.2 SAFETY

This monitor conforms to ISO 9001 and carries the CE mark. The following procedures are recommended to ensure continued maximum safety for the patient and operator.
Do not service the monitor or its accessories while it is being used on a patient.

Always inspect transducers, cables, and power cord before using the monitor. If the power cord or plug becomes cracked, frayed, broken, or otherwise damaged, it should be replaced immediately by a qualified technician.

The monitor should only be plugged into a three-wire grounded receptacle. The monitor is designed for operation from a single-phase power source with its neutral at or near ground potential and with a separate safety-ground conductor. The receptacle should be wired in accordance with the National Electrical Code.

Dangerous voltages exist within the monitor. Covers and panels MUST be in place while the monitor is in use and MUST ONLY be removed by a qualified technician.

The units are not explosion proof and MUST NOT be used in the presence of flammable anaesthetics.

The Rear Panel Accessory connector is provided to interface with specially designed accessory instruments. Total leakage current, including approved accessories shall not exceed the requirements of BS5724 part1 (IEC601 part1).

If in doubt about the correct operation of the units, foetal condition MUST be checked immediately by an alternative method.

SECTION 2

DESCRIPTION OF THE INSTRUMENT

2.1 FRONT PANEL - FETATRACK 210

The Front Panel supports various facilities to control the general functioning of the monitor.These are all membrane activated switches which are operated by pressing for approximately 1 second. Their functions are as follows:-

ON/OFF - This turns the monitor on. If the mains supply is not connected or not switched on, power is supplied by the internal rechargeable batteries.

PRINTER ON/OFF - This controls the action of the thermal printer. Pressing once turns the printer on at the preset speed, pressing again changes the speed, whilst pressing and holding turns the printer off and fast feeds blank paper.

VOLUME Δ and ∇ - These two switches increase or decrease the volume setting of the audio signal from the loudspeaker. The current setting is saved when the unit is turned off and is recalled the next time it is turned on.

UA ZERO - This reads the current output of the Toco Transducer and uses this value as the new Toco zero reference.

POWER ON - Indicates that the mains supply is switched ON.

BATTERY LOW - Indicates when the batteries have reached a point when recharging is necessary.

STORE FULL - When flashing, shows internal memory activity during paper-out or Homecare recording,. When on continously it warns of the internal memory reaching 90% of its FULL capacity.

FHR - This is a three digit display of Fetal Heart Rate in beats per minute. During the transmission of data in Homecare mode, this is also used to indicate the current block number and error messages.

♥ (FETAL PULSE) - The heart shaped window to the right of the FHR display flashes at the fetal heart rate after each computation of fetal heartbeats.

PRINTER cm/min - This single digit display indicates the current print speed when the printer is running. Additionally, in Homecare mode, it shows ‘ d ‘ to indicate that Homecare mode has been selected and ‘ t ‘ to indicate that data has been stored and is ready to be transmitted.

The printer records fetal heart rate (FHR), uterine activity (UA) and fetal movement (Event Mark), together with date, time and recorder speed on thermosensitive z-fold paper.

CARDIO (Blue) - This is the input socket for the FHR Ultrasound Transducer.
UA (Yellow) - This is the input socket for the UA Toco Transducer.

2.2 REAR PANEL - FETATRACK 210

Facilities and controls supported by the Rear Panel are detailed below :-

AC LINE INPUT - This is a 3-pin IEC receptacle for connection to the mains supply via an AC power line cord.

FUSES F1 and F2 - These are incorporated in the AC Line Input receptacle.
For 240VAC operation the rating of the fuses is T 200mA (Time Delay) 250V.
For 110VAC operation the rating of the fuses is T 500mA (Time Delay) 250V.

POWER - This rocker switch applies mains to the unit for battery charging and for normal operation.

ACCESSORY - This is a 25-way 'D'-type socket which enables the monitor to mate with a specified central computer or other accessories.

EXTERNAL MARK - This is a jack socket which accepts the hand held, patient operated push switch which is used to indicate fetal movement. Pressing the button prints an arrow (↑) Event Mark, on the chart paper.

2.3 FRONT PANEL - FETATRACK 260

The Front Panel supports various facilities to control the general functioning of the monitor.

VOLUME Δ and ∇ - These two switches increase or decrease the volume setting of the audio signal from the loudspeaker. The current setting is saved when the unit is turned off and is recalled the next time it is turned on.

PRINTER ON/OFF - This controls the action of the thermal printer. Pressing once turns the printer on at the preset speed, pressing again changes the speed, whilst pressing and holding turns the printer off and fast feeds blank paper.

UA ZERO - This reads the current output of the Toco Transducer and uses this value as the new toco zero reference.

POWER ON - Indicates that the mains supply is switched ON.

FHR - This is a green three digit display indicating Fetal Heart Rate in beats per minute.

♥ (FETAL PULSE) - The heart shaped window to the right of the FHR display contains a multicolour LED which flashes at the fetal heart rate. The colour displayed is an indicator of signal quality: green for a good quality signal, amber for signal quality below optimum, and red for a poor or invalid signal

PRINTER cm/min - This single digit display indicates the current print speed when the printer is running.

UA - This is a yellow three digit display showing the relative contractions strength if a Toco Transducer is connected, or the Intra-Uterine Pressure if an IUP Transducer is connected.

The printer records fetal heart rate (FHR), uterine activity (UA) and fetal movement (Event Mark), together with date, time and recorder speed, on thermosensitive z-fold paper.

CARDIO (Blue)- This is the input socket for the FHR Ultrasound Transducer or ECG Leg Electrode.

UA (Yellow)- This is the input socket for the UA Toco Transducer or IUP Transducer.

2.4 REAR PANEL - FETATRACK 260

Facilities and controls supported by the Rear Panel are detailed below.

AC LINE INPUT - This is a 3-pin IEC receptacle for connection to the mains supply via an AC power line cord.

FUSES F1 and F2 - These are incorporated in the AC Line Input receptacle.
For 240VAC operation the rating of the fuses is T 200mA (Time Delay) 250V.
For 110VAC operation the rating of the fuses is T 500mA (Time Delay) 250V.

POWER - This rocker switch applies mains to the unit for normal operation.

ACCESSORY - This is a 25-way 'D'-type socket which enables the monitor to mate with a specified central computer or other accessories.

EXTERNAL MARK - This is a jack socket which accepts the hand held, patient operated push switch which is used to indicate fetal movement. Pressing the button prints an arrow (↑), or Event Mark, on the chart paper.

2.5 INTERNAL LAYOUT

With the top cover removed and the front panel facing you, there is one large printed circuit board (the Main PCB Assembly) fixed to the base of the monitor. This contains the power supply circuits, microprocessor circuits, printer drive circuits and the external toco and ultrasound circuits. In the FETATRACK 210 it also includes the battery backup circuits. In addition, there is the Display Board Assembly mounted on the rear of the Front Panel, which contains all the displays and keyswitches.

The FETATRACK 260 also has the option of a plug-in ECG / IUP card which is mounted vertically on the 64 way indirect edge connector on the right hand side of the Main board.

2.6 DISMANTLING INSTRUCTIONS

Note: Before dismantling the unit, ensure that the power cord, and all other leads including the transducers are disconnected from the instrument.

The top cover has to be removed to allow access to all of the sub-assemblies within the unit. This is carried out by inverting the unit and resting it on its cover on a clean surface. The four M4 screws around the periphery of the unit, holding the cover in place, are now accessible and can be removed. If the unit is carefully turned back on to its feet the cover can now be removed by lifting it upwards away from the Base, taking care to disconnect the earth bonding cable connecting the Cover to the grounding post on the Rear Panel. This is done by carefully pulling or levering the spade connector away from the grounding post.

WARNING : IF WORKING ON A FETATRACK 210, BEFORE PROCEEDING, FUSE F1 SHOULD BE REMOVED FROM THE MAIN BOARD TO ISOLATE THE RECHARGEABLE BATTERIES.

Should access to the underside of the Main Board be required, this can only be accomplished by removal of the board. This is done by removing the six screws holding the PCB to the Base together with the two transformer fixing screws. Additionally, the four M3 screws holding the Rear Panel on to the Base are removed. These are situated on the Base directly under the Rear Panel. The the two remaining green/yellow earth bonding cables should be removed from the Rear Panel by carefully pulling or levering, the spade connectors away from the grounding terminals. The printhead ribbon cable (from PL1), the motor drive cable (from PL2), the Display Board ribbon cable (from PL4), and the Front Panel input connectors cable (from PL6) should now be unplugged from the Main Board, allowing the Main Board and Rear Panel assembly together to be removed from the unit.

The Main Board is fully functional when removed from the unit provided the Display Board is re-connected.

The Rear Panel does not usually have to be removed from the Main Board, but if it does become necessary, then it can be done as follows.

The brown and blue wires from the mains transformer to the mains input switch should be disconnected by carefully pulling or levering the spade connectors away from the switch contacts. Similarly, the black ground reference wire from the Main Board should be removed from the remaining ground terminal on the Rear Panel. The loudspeaker wires should also be disconnected. After removal of the nut on the External Mark jack socket, the Rear Panel assembly and the Main PCB assembly can be separated.
The Front Panel assembly can be separately removed from the Base if desired.
The Display Board ribbon cable (from PL4), and the input connectors cable (from PL6) should first be unplugged from the Main Board. The monitor is then inverted to access the Base allowing the four M3 screws holding the Front Panel assembly to the Base to be removed. Whilst supporting the Front Panel assembly, the monitor is carefully returned to its feet. The Front Panel bracket (connecting the Front Panel to the right hand side of the Printer) is disconnected by unscrewing the M3 nut holding the bracket to the corner of the Display Board. This allows the entire Front Panel Assembly to be removed, taking care to disconnect the green/yellow earth continuity cable, situated below the UA input socket, by carefully pulling the spade connector away from the earth post.

The Display Board may be removed from the Front Panel Assembly, if required, by removal of the three remaining M3 nuts situated at the corners of the Display Board.

To remove the ECG / IUP card from an FETATRACK 260 it is necessary to disconnect the input connector cable assembly from (PL1) and to slacken, or remove, the M3 x 12 clamp screw at the rear of the pcb. The card may then be gently eased vertically away from the edge connector.

SECTION 3

CIRCUIT DESCRIPTIONS

3.1 INTRODUCTION

The Main Board is common to both the FETATRACK 210 and the FETATRACK 260. The circuitry has been divided into functional blocks, each block being described separately. Where there are detail differences between the FETATRACK 210 and the FETATRACK 260 they are oulined in the relevant section. The blocks are as follows :-

Power Supplies
Ultrasound Circuit
Toco Circuit
Microprocessor Circuit
Printer Interface
Display and Keyboard circuit FETATRACK 210
Display and Keyboard circuit FETATRACK 260
ECG and IUP Circuit

3.2 POWER SUPPLY CIRCUITS

The 240/110 VAC supply enters the FETATRACK 210, and FETATRACK 260, through a double fused mains inlet, and is fed via a double pole switch to a low voltage mains transformer. For greater isolation and safety this is of split bobbin construction, which physically separates the primary and secondary windings.A thermal fuse (non resetting) is contained in the primary side.

The input supply voltage is stepped down via the secondary to a nominal 30 VAC. This is full wave rectified by bridge rectifier BR1, and smoothed by capacitor C1, to give a nominal raw DC voltage of 42V.

From this point the circuit differs between the FETATRACK 210 and the FETATRACK 260, the FETATRACK 260 being a mains only device, whilst the FETATRACK 210 additionally contains re-chargeable batteries for short term remote use.

3.2.1 FETATRACK 210 BATTERY CIRCUIT

The raw +42V DC feeds a linear regulator IC1 connected as a 26mA constant current source which is used to trickle charge the re-chargeable battery packs BP1,2 and 3 whenever the mains is switched on. These battery packs are connected in series and provide a nominal voltage of +29V to power the monitor whilst being used away from a mains source, or in the event of a mains failure.

The raw +42V and the battery voltage are routed to the rest of the circuitry as V_{unreg} through blocking diodes D1 and D2.With the mains switched on, the raw +42V is automatically used as the source via D1, if the mains is off, the battery voltage becomes the source via D2.

In the FETATRACK 210 the unit is switched ON by the Front Panel ON/OFF switch. This momentarily grounds the CLK input of IC2A causing the Q output to change state to a 'high'. This turns on TR1, which in turn turns on the FET switch TR2, thus switching V_{unreg} to the rest of the circuit. The monitor is switched OFF by pressing the Front Panel ON/OFF switch again, which clocks IC2A , this time changing the Q output to a 'low'. This causes the FET switch TR2 to turn off (via TR1) thus removing power to the rest of the circuit.

The potential divider R5/R6 on the battery output, provides a voltage $V_{standby}$ of approximately +11.6V to supply IC2 continuously. This enables the monitor to be turned on at any time, provided the batteries are charged. Switchbounce on the ON/OFF switch is removed by a time delay applied to IC2 by R79 and C16.

In the FETATRACK 260, the raw +42V DC is routed directly to the rest of the circuitry without the interposing FET switch, the monitor turns on as soon as the mains is switched on. The FETATRACK 260 has additional smoothing of the raw DC (provided by Cx) to cater for the additional current demands.

3.2.2 FETATRACK 210 & 260 STABILISED SUPPLIES

The rest of the power supply circuit is common to both the FETATRACK 210 and the FETATRACK 260.

V_{unreg} feeds two switching regulators, IC3 and IC5. These regulators are synchronised, the switching frequency being set to approximately 120khz by the high stability capacitor C6.

IC3 is configured as a step-down regulator to provide a regulated +5V logic supply.
IC5 is configured as a step-down regulator to provide a regulated +15V supply for the analogue circuits. A -15V unregulated supply for the analogue circuits is also provided by a second winding on the inductor T3.

3.2.3 PRINTER SUPPLY

The printhead and printer motor are supplied from a circuit based around the linear regulator IC4 whose output is variable from +18V to +24V, and is set by VR1. This adjustment is factory set.
The printhead demands high current pulses (up to 10A) of short duration. As the regulator alone cannot deliver greater than 1.5A, this is accommodated by the addition of a by-pass transistor TR3, around IC4. When the current demanded exceeds 0.5A TR3 turns on supplying the excess current required, voltage stability still being maintained by IC4.

To avoid excessive fluctuations on V_{unreg}, a large resevoir capacitor C8 is provided from which the required current is drawn during peak demands.
The printer supply is not present continuously, but is turned on only when the printer is operated. Operation of the Printer ON/OFF switch on the Front Panel initiates a signal 'Printer Off', which turns on FET switch TR9, thus routing V_{unreg} to the regulator circuit IC4. When printing is terminated, TR9 is turned off and hence the printer supply. This conserves power, which is particularly relevant in the case of the FETATRACK 210 when running on its internal batteries.

3.3 ULTRASOUND CIRCUIT

The ultrasound circuit is built up of four discrete sections. These are :-

Oscillator and Transmitter amplifier
Receiver and Detector
Audio amplifier
Signal pre-processing.

These operate to produce a continuous wave of 2.1MHz ultrasound which is passed to the transmitter crystal in the transducer.The signal is reflected from moving interfaces within the body to the receiver crystal in the transducer. It is then amplified, and then detected so the Doppler shift resulting from the moving interface can be heard and passed via signal pre-processing circuitry to the A/D converter for rate calculation.

3.3.1 OSCILLATOR & TRANSMITTER AMPLIFIER

Field effect transistor TR4, together with L1, C45, C46 and associated components, form a Colpitts oscillator. This runs at a frequency of 2.1MHz, producing a sinewave at the drain of TR4 of 22V amplitude.

This signal is then fed to the output stage TR5, which has a tuned circuit (L2/C48) as its collector load. The output transformer L2 has a secondary winding which matches the impedance of the transmitter crystal, to which it is connected directly.
The output power is varied by adjustment of VR2 during test.

3.3.2 RECEIVER & DETECTOR

The reflected signal of modulated 2.1MHz ultrasound is fed via a resonant transformer circuit L3/C52 to the gate of TR6. TR6 and TR7 form a cascode amplifier whose drain load comprises the resonant circuit L4/C51. From the drain of TR7 the amplitude complex of the received signal is detected by passing the signal through diode D16, the high frequency component being filtered by C53/R54, the frequency breakpoint being at 1KHz. The raw low frequency heart complex is then amplified and filtered by IC29 and its associated components, which form a bandpass filter amplifier with a bandwidth of 150Hz to 1KHz. This signal is passed to the audio amplifier and signal pre-processing sections.

3.3.3 AUDIO AMPLIFIER

The audio signal passes to the analogue switch IC28 where the microprocessor routes the signal to a digital attenuator comprising IC23 and buffer amplifier IC32, where the volume setting is determined by the microprocessor, according to the user operation of the Volume switches on the Front Panel. From here the gain controlled signal is fed via R35 to the input of a monolithic power amplifier IC31 which drives the loudspeaker on the Rear Panel.
The analogue switch IC28 also routes the Tape In/Out and ECG beep signals as appropriate.

3.3.4 SIGNAL PRE-PROCESSING

The detected audio complex from IC29 is also fed via the analogue switch to a bandpass amplifier arranged around IC29B, the filter characteristics being arranged to reject signals below 150Hz and above 1KHz. This output is taken via C40 to an AGC circuit formed around a VOGAD, IC25.
The amplitude stablised signal is then amplified by IC26A and full wave rectified by the combination IC26B and D15. The rectified signal is then buffered by IC27A and smoothed by the active filter IC27B. The smoothing is achieved by the low pass active filter having a -3db response at 5Hz, hence giving the average value of the audio complex. This signal is then passed to the A/D converter, IC22, for further processing by the microprocessor.

3.4 TOCO CIRCUIT

A stable voltage of +5.1V is obtained from zener diode ZD3, which is buffered by the non-inverting buffer IC30A to provide a positive excitation voltage for the Toco Transducer. It is then inverted by IC30B to provide a negative excitation voltage for the Toco Transducer. This is also used to pull the Toco input negative, via R62, when no transducer is connected.

The Toco input is fed to a non-inverting amplifier IC24, which has an H.F. bandwidth of 1 KHz, and whose output is fed directly to IC22, the A/D converter.

3.5 MICROPROCESSOR CIRCUIT

The microprocessor circuit is arranged around IC10, an HD63B09 - a fast, second generation 8/16 bit central processing unit (CPU).

When power is applied to the circuit, a microprocessor supervisory circuit IC33 waits for the power rail to become stable, and then 100 ms later releases the reset on IC9, IC10 and IC21 by going high (logic 1) to +5V. This starts the CPU working, which reads from the EPROM IC11, the bytes at the very top of its memory map. This points the CPU to the start position from which to start executing. This sets up all the peripheral devices, and in the case of the PIA IC9, (which has an interrupt timer), starts the system clock, which consists of interrupts from IC9 pin 21 to the CPU, IC10 pin 3, at a rate of 1 every 0.5 ms. As all functions are time dependant nothing starts without this clock. The CPU now reads all the preset variables from IC12, the battery protected RAM.

The supervisory circuit, IC33, controls the chip enable (E1) and the power rail, Vcc, of IC12, forcing the device into a low power mode when the +5V logic supply falls below a preset threshold.

The battery source, BP4, for the RAM backup, is a 3V lithium cell with a nominal life of 10 years.

After the CPU has loaded the variables, it checks three checksums to validate the information it has read. If an error is detected it will display 'Err' on the display and reload the RAM with data from EPROM so the system can continue to operate.

Selection of the individual devices is controlled by the chip select circuits IC18, IC19 and IC15.

The RAM IC12 uses all the bottom half of the systems memory map, and is therefore selected when A15, the most significant address bit, is low. The rest of the devices are selected according to A15 being high and the combination of A12, 13 and 14 as decoded by IC18 (a 3 to 8 line decoder).

The table following this section shows the memory locations of each device. IC11 takes the top quarter of the memory map with the outputs Y7, Y6, Y5, & Y4 of IC18 being gated via IC19 so that with any one of the outputs low, IC11 is selected.

IC13 is a battery backed Real Time Clock which derives its clock reference from its own 32.768 KHz crystal, XTL2. The battery source here, BP5, is also a 3V lithium cell. The clock is read on demand from the CPU, and set via the user setup program. In the event of a power rail failure, the device automatically switches to its battery BP5 for its power source.

IC17 and IC19 form an RS232 communications system. IC17 is an asynchronous communications interface adaptor (ACIA) and is controlled by the CPU, whilst IC19 is a line driver/receiver.

Timing is derived from XTL3, a 1.843 MHz crystal, whilst communication speed is controlled by the system software option selected in the setup.

IC20 supplies a -5V reference to IC19, the RS232C line driver, allowing the signal swing to be +/- 5V.

RS 232 CONNECTIONS

Accessory Port Pin Number 25 Way D Type (Male)		Computer 25 Way D Type (female)	
2	TXD	3	RXD
3	RXD	2	TXD
5	CTS	20	DTR
7	GND	7	GND

Most analogue signals eventually require digital signal processing for display, chart recording or digital transmission. The signals are presented to IC22, a 10 bit A/D converter with an 8 way multiplexed input. The converter accepts unipolar signals of 0 - +5V. In order to obtain digitisation of bipolar signals, a voltage pedestal is applied to the requisite analogue input.

PIA, IC21, interfaces the CPU with the display and keyboard circuit, as well as detecting the selection of Ultrasound or ECG (pin 16), and the presence of an Event keypress (pin 17). Pin 18 of IC21 detects the end of conversion pulse from the A/D converter, IC22, passing its information on request to the CPU. The controlling program breaks down the displayable characters into segments and strobe information, which is passed via IC21 pins 2-8 and pins 10- 13, to a 20way connector PL4 and thence to the Display Board.

VIA, IC9, is split between audio volume control and printer interface.

PA0-5 (pins 2-7) interface with IC23, the digital attenuator (volume control). The program reads the last recorded 6 bit word from RAM IC12 and passes this to IC23, which sets a precise amount of attenuation of the audio signal.
Pressing Volume UP or DOWN on the Front Panel will cause the program to increase or decrease the 6 bit word to IC23. Pressing and holding causes the word to increase in jumps.

Pin 9 of IC9 (PA7) outputs pulses in time with each detected ECG complex in the FETATRACK 260, this pulse being passed to IC28 where it gates a tone burst to the audio circuit to beep on each ECG complex.

The last output from side A of IC9 is PA6 (pin 8), which indicates bradycardia alarm status. This pulses low when a bradycardia is detected and pulls pin 8 of IC28 low, passing a tone directly into the audio amplifier.

Memory Map

FFFF : : : C000	EPROM, IC11
B000	NOT YET ASSIGNED
A000	A/D CONVERTER, IC22
9000	REAL TIME CLOCK, IC13
8400	PIA, IC21
8200	RS232, IC17
8100	VIA, IC9
7FFF : : : 0000	RAM, IC12

3.6 PRINTER INTERFACE

IC9 contains timers, serial drivers and peripheral drivers, and is therefore also used for printer interface and control. The principle of operation of the printhead and motor drive circuit is as follows:

Data to be printed is decoded by the software into bit positions within the allowable area of the printhead (256 for the FETATRACK 210, 1024 for the FETATRACK 260). This data is then passed in parallel to the serial converter on IC9 and output as serial data (Print Data) from IC9 pin 19 to the printhead. IC9 also provides a serial clock (Print Data Clock) to the printhead from pin 18.

The data is latched onto the printhead by a pulse from IC9 pin 39, which is first inverted by buffer IC7A (Print Data Latch). The Print Data Strobes (1-4) to the printhead cause the appropriate print elements to be energised and 'burn' the paper.
When the printer is strobed to burn the data, a timer is set in IC9 which will interrupt the CPU when the paper is burned. At this point the strobe is removed. If this should not happen, a monitor circuit IC6 which is connected via diodes D7-10 to the strobe lines, will time out, this then turns off the output of IC8 pin 10 removing the printhead supply, hence preventing printhead burn-out.

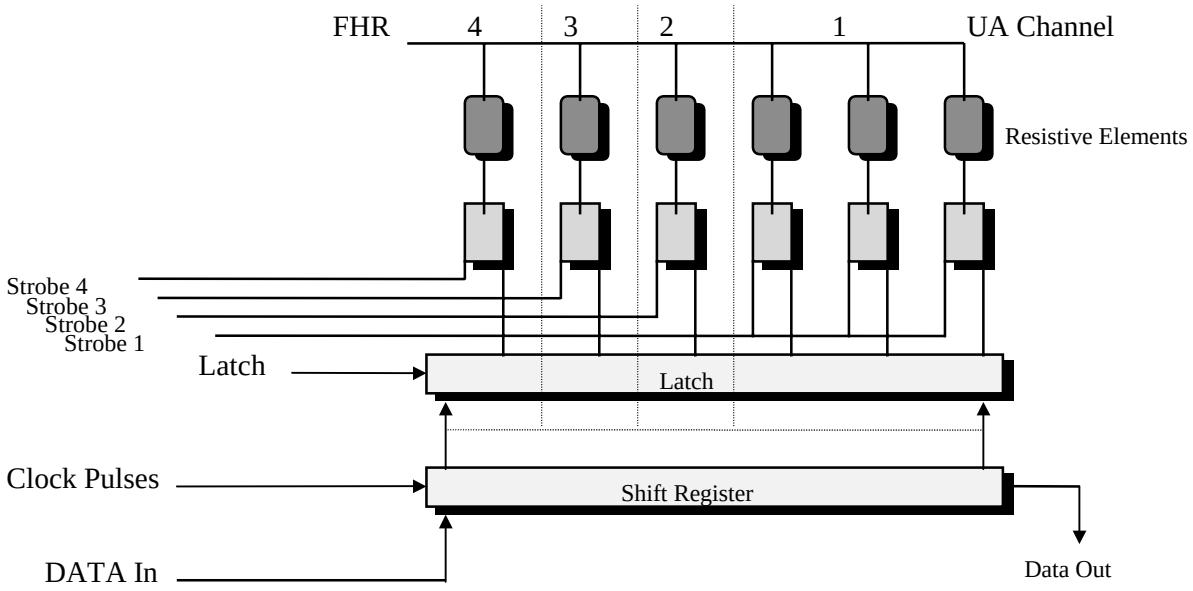
Under normal conditions, with the Printer OFF, there is no supply connected to the printhead. Only when printing is requested does IC21 pin 19 go low, in turn causing IC8 pin 10 to go low if all print strobes are in a high condition.

The Printer motor is a synchronous stepper motor controlled by the CPU via IC9. IC9 pins 14-17 generate motor drive signals, which are buffered by the high voltage drivers in IC8. These ground the motor windings in turn, hence stepping the motor. Diodes D13-17 catch any overshoot spikes.

To further protect the printhead, the system will only print if there is paper loaded into the recorder. This is detected by an IR proximity detector (the Paper Out Sensor) mounted beneath the paper pack in the paper tray. This is monitored by the A/D converter, IC22 (pin 28), simply registering a'low' for paper present, or a 'high' for paper out.

PRINTHEAD SCHEMATIC INFORMATION

Section Number



3.7 FETATRACK 210 DISPLAY and KEYBOARD CIRCUIT

A 20way ribbon cable connects PL1 on the Display Board to PL4 on the Main Board. Data is presented to IC1 and IC2 on the Display Board from the PIA IC21 on the Main Board. IC1 is a high current Darlington array and passes the the segment information to the 7-segment displays LED5-LED8. Strobe data is presented to IC2, the outputs of which pull the bases of TR1-4 low, turning them on, and thus connecting the displays to the +5V power rail. LED1-LED3 are similarly connected to the +5V rail by these strobe lines, but these are caused to turn on by the signal ‘Energise LED’.

Switches SW1-4 are also connected to the strobe lines, through blocking diodes D1-4. When a switch is pressed the strobe pulse is passed back as ‘Switch Sense’, to pin 9 of IC21 on the Main PCB.

3.8 FETATRACK 260 DISPLAY and KEYBOARD CIRCUIT

A 20way ribbon cable connects PL1 on the Display Board to PL4 on the Main Board. Data is presented to IC1, IC3 and IC4 on the Display Board by IC21 on the Main circuit card. IC1 is a high current Darlington array and passes the the segment information to the 7-segment displays LED2-LED5 and LED9 - LED11.

Individual display strobe lines are decoded from signals Strobe D1-D3 by a 4 to 8 line decoder IC3. The decoded output is then passed to IC2, another high current Darlington array, the outputs of which pull the bases of TR1-7 low, connecting the 7-segment displays to

the +5V power rail. The ‘Strobe D4’ and ‘Energise LED’ signals are passed to a high current bi-phase driver IC4 which drives the tri-colour LED - LED12.

The state of the input signals to IC4 determines the output phase from IC4 which will appropriately energise the LED’s within LED12 to show the required colour (green, amber or red).

Switches SW1-4 are also connected to the display strobes for LED2-LED5, through blocking diodes D1-4. When pressed, the strobe pulse is passed back to pin 9 of IC21 on the Main PCB as ‘Switch Sense’.

3.9 ECG and IUP CIRCUIT *(FETATRACK 260 Intrapartum only)*

ECG signals enter the isolated section of the circuit board via PL1 from the CARDIO socket on the Front Panel. The signals are buffered by U14 and U15 before being amplified by the instrumentation amplifier U11. DC offsets introduced by certain ECG electrodes are eliminated by means of the dc servo circuit (IC10 and associated components) around U11. The amplified signal is transferred to the non-isolated circuitry via a linear isolation amplifier comprising U9, OP1, U6A, OP2 and U6B.

The signal now passes through an active twin-T notch filter (IC5 and associated components) centered on 50Hz to remove any mains pick-up on the signal.

This is followed by a digitally controlled potentiometer (U1) which, with the following amplifier,U2A, is used to provide an AGC function under the control by the microprocessor. Subsequent stages provide filtering of the signal to remove unwanted noise and out-of-band signal content.

Finally the signal is rectified and buffered (U4) before leaving the board to be routed to the A/D Converter on the Main Board.

IUP signals also enter the isolated section of the circuit board via PL1 but this time from the UA socket on the Front Panel. These signals are amplified by the instrumentation amplifier U16 and are then transferred to the non-isolated circuitry via another linear isolation amplifier, comprising U13, OP3, U7A, OP4 and U7B.

The signal is now amplified (U8A) and filtered (U8B), offset control being provided by VR3 and gain control (span) by VR4, before leaving the board to be routed to the A/D Converter on the Main Board.

Energisation for the IUP transducer is provided by the +5V high stability regulator, RV1.

The power rails required by the isolated circuits are supplied by a multi-output dc-dc Converter (PSU).

SECTION 4

TEST AND CALIBRATION

4.1 INTRODUCTION

The following sections detail tests to ensure that the FETATRACK 210 or FETATRACK 260 is operating within specification. These tests may be performed in whole or part. However, if any repairs are carried out to the power supply circuits then it is recommended that the whole test/calibration procedure is undertaken.

The test procedures may be performed without removal of the circuit board from the unit.

4.2 PERFORMANCE CHECKS

The following procedure is intended to provide a means of determining the functional status of the unit. It should be included as part of a preventative maintenance plan and should be performed on a regular basis.

Plug the monitor line cord into a grounded mains outlet of suitable line voltage and frequency, as indicated on the Rear Panel of the FETATRACK 210 or FETATRACK 260.

Switch ON the mains using the POWER switch on the Rear Panel. The green Front Panel ON LED will illuminate.

NOTE: The FETATRACK 260 is now switched ON: the FETATRACK 210 additionally requires the Front Panel ON/OFF switch to be pressed before proceeding further.

The FHR display will first show the system selftest “888”, followed by the software revision, and finally "---". This indicates that the instrument is switched on and awaiting inputs.

Load chart paper to the Printer (for assistance see operating instructions) and ensure the paper is correctly aligned.

Press the PRINTER ON/OFF switch on the Front Panel to turn on the Printer which will proceed to run at either 1, 2 or 3 cm/min dependent on the preset value. This is indicated on the Printer speed display.

4.2.1 ULTRASOUND

Plug the Ultrasound Transducer into the blue CARDIO socket on the Front Panel and set the audio volume to maximum by pressing the VOLUME Δ switch.

Place the transducer in the palm of your hand and gently stroke the back of the hand at a constant rate of about 2 times a second.

Check that a corresponding audio signal is output from the loudspeaker on the Rear Panel. Observe that the FHR display shows the simulated rate (approx 120) and the heart shaped foetal pulse LED flashes in time with the audible signal (on an FETATRACK 260 the colour of this LED will also vary according to the quality of the signal). The ultrasound trace on the chart paper should also correspond to the FHR information being displayed.

4.2.2 UA/TOCO/CONTRACTIONS

Plug the Toco Transducer into the yellow UA socket on the Front Panel and place the Transducer head face up on the table. Allow to settle for a short while (1-2 minutes) and then press UA ZERO to set the no load trace to the baseline on the printout (the baseline will be a preset value between 0 and 20, but typically 0, 5, or 10, as selected in the set-up procedure).

Place a 100gm weight on to the centre of the Transducer and check that the Toco trace on the chart recording increases by 20 units+/- 10%.
Remove the weight and the trace should return to the baseline.

Note: The FETATRACK 260 will also display the Toco value in the UA window on the Front Panel.

4.2.3 EVENT MARKER

Plug the hand held remote Event Marker into the 'External Mark' socket on the Rear Panel. Press the Event Marker button once and note that a half arrow is printed at the bottom of the FHR graticule on the chart paper. The arrow is printed each time the Event Marker button is pressed.

4.2.4 PRINTER

Turn off the printer by pressing and holding the PRINTER ON/OFF switch until the print speed indicator (cm/min) extinguishes. The Printer will stop printing and feed approx. 5cm of paper before stopping automatically

Press and hold the UA ZERO switch and then press and hold the PRINTER ON/OFF switch at the same time. The instrument will now perform a printhead calibration check.

The FHR Display will read 'tst' (TEST), approximately 3 seconds later the recorder will run at high speed printing a calibration pattern. This consists of two longitudinal lines, one at 150 on the FHR scale and one at 50 on the UA scale. These calibration lines are followed by a zig-zag then a chequerboard pattern.This process is repeated for 5 cycles after which the Printer will automatically turn off.

The trace should be inspected to ensure that the lateral alignment is correct (i.e. the printed 150 and 50 lines align with those on the chart paper, +/- 0.6mm) and that the density of the trace is even along the complete length and width of the trace.

In the event that the lateral alignment requires adjustment, this can be corrected by loosening the two M4 screws at the rear of the recorder assembly at the point where the glass fibre head-spring is attached to the pivot bar just in front of the motor.This allows lateral movement of the head assembly which may be moved to align the printhead with the chart paper. Small adjustments only should be made, each time running the test trace to check the

new alignment. Care should be taken also to ensure that the pivot blocks, into which the M4 screws fit, are abutted close to the side walls on both sides of the printer chassis.

Uneven print density will generally be caused by a build of dirt (ink and paper dust) on the print elements on the printhead and can be overcome by cleaning.

4.2.5 ECG *(FETATRACK 260 Option only)*

Connect an ECG simulator to the leg electrode. Set the output to 100 uV pk and the rate to approximately 150BPM.

Connect the leg electrode to the blue CARDIO socket on the Front Panel and allow the ECG circuit to stabilize (this takes approximately 10-15 seconds). The FHR display will show the rate, synchronised with an audible bleep. This rate will also be printed on the chart recording.

Decrease the rate on the simulator and the monitor should follow this change; increase the rate and the monitor should again follow the change. Check also that the heart shaped fetal pulse indicator flashes at the same rate and is green (good signal).

4.3 SETTING UP THE MONITOR

Both the FETATRACK 210 & 260 can be configured to suit various applications. The mode of operation of the monitor is programmable through the Front Panel to give a certain amount of customisation. This facility is controlled by the system software. The options may be differ from the list below as new software releases are made available. If this is the case, call your supplier or Seward Medical Systems service department for the upgrade information.

4.3.1 SETTING UP THE FETATRACK 260 (V 1.01 System Software)

The programming mode is entered by pressing and holding UA ZERO whilst turning the monitor ON. The displays will show :-

8 8 8
8 8 8
and then
1 0 1
8 8 8
and then
A 0 1
0 0 0

Release the UA ZERO button and select the desired options from the sequence below.
The following table gives a description of the individual fields and their options. To change the value of the option, press VOLUME⇧, In some fields VOLUME ⇩ will also change the value.

Pressing UA ZERO saves the selected value and moves on to the next field. At any time, pressing and holding PRINTER ON/OFF will exit the setup program.

REAL TIME CLOCK

Field	Value	Description
A	1 - 24	Sets the real time clock Hour Mode
b	0 - 60	Sets the real time clock Minute Mode
c	1 - 12	Sets the month
d	1 - 31	Sets the day
E	0 - 99	Sets the year

ALARM SETTINGS

ALO	OFF	Sets Low Heart Rate alarm to OFF irrespective of MASTER ON/OFF state.
	ON	Sets Low Heart Rate alarm to ON. This option is also controlled by the Master ON/OFF setting (pressing Volume up and down simultaneously).
	60 - 120	Incrementing in 5's: Sets the alarm threshold at which LOW alarm computing starts
AHI	OFF	Sets the High Heart Rate alarm to OFF irrespective of MASTER ON/OFF state.
	ON	Sets the High Heart Rate alarm to ON. This option is also controlled by Master ON/OFF setting (pressing Volume up and down simultaneously).
	160 - 200	Incrementing in 5's: Sets the alarm threshold at which the HIGH alarm computing starts.

At this point on the FETATRACK 260 display will return to - - -
Press and hold UA ZERO: the display will read **EnG** and then move on to the following functions :-

Field	Value	Description
F	E	Sets the printed date to European format of dd/mm/yy
	A	Sets the printed date to American format of mm/dd/yy and locks the print speed to 3 cm/min.
g	1 - 3	Sets the recorder printer chart speed to 1, 2, or 3 cm/min
H	20	Sets the chart scaling factor to 20 beats / cm.
	30	Sets the chart scaling factor to 30 beats / cm.
I	bb	Beat-to-beat mode. Removes averaging and beat editing from the rate processing.
	bE	Beat edit mode. Removes out of limit FHR and introduces a 3 beat average.
I	*01 - 04*	*Selects the number of beats befor a pen lift (when US format is* ***03*** *selected)*
J	0 - 20	Sets the Toco baseline to a value between 0 and 20 units on chart printout.
L	S	S - Single filter coefficient for UA signal processing.

	d	d - Double filter coefficient for UA signal processing.
n		Sets the Toco Transducer scale factor.
	01	100 gm pressure prints as 20 units.
	02	100 gm pressure prints as 40 units.
	03	100 gm pressure prints as 60 units.
	04	100 gm pressure prints as 80 units.
	05	100 gm pressure prints as 100 units.
o	A	Antenatal mode. Selects antenatal mode to operate as normal fetal monitor.
	r	Remote mode. Selects remote mode for connection to a central station computer system.
P		Baud rate.
	96	selects 9600 baud.
	03	selects 300 baud.
	06	selects 600 baud.
	12	selects 1200 baud.
	24	selects 2400 baud.
	48	selects 4800 baud.
Pt		Selects modem type.
	Ptc	Selects Accoustic modem.
	PtL	Selects Line modem
PF		Selects communications interface.
	PFc	CCITT format.
	PFb	Bell Format.
r	01 - 99	Unit ID number:
tc0	-	Records Toco Transducer ‘no load’ value. Plug in Toco Transducer and wait 30 seconds. Press UA ZERO.

The display will then read :-

8 8 8
8 8 8
followed by
1 0 1
0 0 0
and then
- - -
- - -

4.3.2 SETTING UP THE FETATRACK 210 (V1.01 SYSTEM SOFTWARE)

The FETATRACK 210 fitted with V1.01 System software can be configured for two specific applications - Standard Antenatal Mode (a) or Remote Mode (r) for connection to a central station.

Connect the unit to the mains supply and switch the rear ON/OFF switch to the ON position. Observe the green power on LED on the front panel illuminates. Whilst depressing the front panel ON/OFF switch, press and hold the UA ZERO button to enter the programming mode. The display will read :-

8 8 8
A 0 1

When the A 0 1 message is displayed release the UA ZERO button.

The following table is an explanation of the options available. To change the setting press VOLUME UP ⇑. In some options pressing VOLUME DOWN ⇓ will also change the setting. Having selected the relevant option press UA ZERO to accept the setting.

Field	Option	Description
A	1 - 24	Sets the hours for the real time clock.
b	0 - 60	Sets the minutes.
c	1 - 12	Sets the month.
d	1 - 31	Sets the day.
E	0 - 99	Sets the year.

At this point the display will momentarily return to - - -, press and hold the UA ZERO, the display will change to ENG which indicates it has selected the engineering set up mode. Select the options from the table below :-

Field	Option	Description
F	E	Selects European format for the time and date.
	A	Selects American format for the time and date. *** see below.**
g	1,2,3	Selects the printer chart speed 1, 2 or 3 cm/min. *** In American format speed cannot be changed when unit is operating.**
H	30	Selects 30 b/cm chart paper scale.
	20	Selects 20 b/cm chart paper scale. (**For Homecare applications ONLY**)

I	bE	Removes out of limit FHR and introduces a 3 beat average.
	bb	Removes the averaging routine from the rate process.
I	*02,03,04*	** In American format, option I offers the user to select the number of beats before a pen lift.*
J	00 - 20	Sets the Toco baseline.
L	S	Smoothing of toco trace. (single coefficient)
	d	Smoothing of toco trace. (double coefficient)
n	05	Sets the Toco Transducer scale factor.
	01	100 gm pressure prints as 20 units.
	02	100 gm pressure prints as 40 units.
	03	100 gm pressure prints as 60 units.
	04	100 gm pressure prints as 80 units.
	05	100 gm pressure prints as 100 units.
		** set to 01.*
O	A	Sets the unit to standard Antenatal mode.
	r	Sets the unit to Remote mode- for connection to a central station monitoring system.
P		Sets the baud rate for data transmission.
	03	Selects 300 baud.
	06	Selects 600 baud.
	12	Selects 1200 baud.
	24	Selects 2400 baud.
	48	Selects 1200 baud .
	96	Selects 9600 baud.
Pt	c	Selects Acoustic coupler modem interface.
	L	Selects Line modem interface.
PF	c	Selects CCITT format for data transmission.
	b	Selects BELL format for data transmission.
r	01 - 99	Sets the unit ID number.
tcO		Sets and records the TOCO no load value. Plug in the TOCO transducer and wait 30 seconds. Press UA zero. Set up is now complete. The display will then read **8 8 8** (system calibration) **1 0 1** (software revision) and then reset the display to - - - .

4.3.3 SETTING UP THE FETATRACK 210 (V 2.01 SYSTEM SOFTWARE)

The FETATRACK 210 fitted with V2.01 System software can be configured for two specific applications - Standard Antenatal Mode (a) or Domiciliary Mode (d) for monitoring the patient at home.

The FETATRACK 210 can be configured for specific applications by programming the unit through a series of key presses through the front panel switches. This version of software offers the user the choice of two modes of operation. - Ante natal mode (**A**) or Domicilliary Mode (**d**).

Connect the unit to the mains supply and switch the rear ON/OFF switch to the ON position. Observe the green power on LED on the front panel illuminates. Whilst depressing the front panel ON/OFF switch, press and hold the UA ZERO button to enter the programming mode. The display will read :-

8 8 8
A 0 1

When the A 0 1 message is displayed release the UA ZERO button.

The following table is an explanation of the options available. To change the setting press VOLUME UP ⇑. In some options pressing VOLUME DOWN ⇓ will also change the setting. Having selected the relevant option press UA ZERO to accept the setting.

Field	Option	Description
A	1 - 24	Sets the hours for the real time clock.
b	0 - 60	Sets the minutes.
c	1 - 12	Sets the month.
d	1 - 31	Sets the day.
E	0 - 99	Sets the year.

At this point the display will momentarily return to - - -, press and hold the UA ZERO, the display will change to ENG which indicates it has selected the engineering set up mode. Select the options from the table below :-

Field	Option	Description
F	E	Selects European format for the time and date.
	A	Selects American format for the time and date. *** see below.**
g	1,2,3	Selects the printer chart speed 1, 2 or 3 cm/min. *** In American format speed cannot be changed when unit is operating.**
H	30	Selects 30 b/cm chart paper scale.
	20	Selects 20 b/cm chart paper scale. (**For Homecare applications ONLY**)

I	bE	Removes out of limit FHR and introduces a 3 beat average.
	bb	Removes the averaging routine from the rate process.
I	*02,03,04*	** In American format, option I offers the user to select the number of beats before a pen lift.*
J	00 - 20	Sets the Toco baseline.
L	S	Smoothing of toco trace. (single coefficient)
	d	Smoothing of toco trace. (double coefficient)
n	05	Sets the Toco Transducer scale factor.
	01	100 gm pressure prints as 20 units.
	02	100 gm pressure prints as 40 units.
	03	100 gm pressure prints as 60 units.
	04	100 gm pressure prints as 80 units.
	05	100 gm pressure prints as 100 units.
O	A	Sets the unit to Antenatal mode.
	d	Sets the unit to Domiciliary mode.
P	12	Sets the baud rate for data transmission.
	03	Selects 300 baud rate.
	12	Selects 1200 baud rate.
	96	Selects 9600 baud rate.
Pt	c	Selects Acoustic coupler modem interface.
	L	Selects Line modem interface.
PF	c	Selects CCITT format for data transmission.
	b	Selects BELL format for data transmission.
r	01 - 99	Sets the unit ID number.
tcO		Sets and records the TOCO no load value. Plug in the TOCO transducer and wait 30 seconds. Press UA zero. Set up is now complete The display will then read **8 8 8** (system calibration) **2 0 1** (software revision) and then reset the display to - - - .

4.4 TEST PROCEDURES

EQUIPMENT

Oscilloscope:	2 channel 50MHz bandwidth, minimum resolution 5mV/cm
Digital Multimeter:	4 Digit DVM measuring 1mV, 1mA, 0.1ohm
Frequency Counter:	0 - 10MHz, resolution 1kHz at 2MHz
Signal Generator:	10Hz to 10MHz, 1mV to 10V sine-wave
ECG Simulator	30 to 240 BPM, 100uV output

POWER SUPPLY

Plug the monitor line cord into a grounded mains outlet of suitable line voltage and frequency, as indicated on the Rear Panel of the FETATRACK 210 or FETATRACK 260.

Turn the monitor on at the Rear Panel switch. The green Front Panel LED will illuminate.

NOTE: The FETATRACK 210 requires the Front Panel ON/OFF switch to be pressed before proceeding further.

The display will first show the system selftest (888) followed by the software revision number, and finally "---". Connect the negative probe of the DVM to 0V (chassis) and check the voltages at the following points :-

Test Point	Voltage
P1 (D12 anode)	+42V +/- 10V dc
RHS of F1 (FETATRACK 210 only)	+32V Nominal *see Note 1
Lk1	+5V +/- 0.2V dc
Lk2	-15V +/- 1V dc
Lk3	+15V +/- 1V dc

Check the battery charging current by removing F1 and measuring across F1 contacts with the DVM on current range. This should be 26mA nominal. *see Note 1

* Note 1 - These values will vary depending on battery condition.

Check the Printhead voltage by pressing the PRINTER ON/OFF switch on the Front Panel and checking the voltage at P10 with the DVM. This should be +18Vdc on the FETATRACK 210 and +20Vdc on the FETATRACK 260. This can be adjusted if necessary by VR1

ULTRASOUND CIRCUIT

Plug the Ultrasound Transducer into the CARDIO socket (blue) on the Front Panel.

Check the voltage at P25. This should be +11.4 +/- 0.5Vdc.

Connect the oscilloscope to PL6 pin1. The signal should be a clean sine wave whose frequency is between 1.95 and 2.05Mhz and amplitude is 6Vpk-pk.

Connect the oscilloscope to D16 cathode (marked with a stripe). This should be a dc voltage of >+8V.
Connect the oscilloscope to P26 and gently stroke the transducer faceplate. This should be a low frequency audio signal centred on 0V varying as the faceplate is stroked.
This should also be heard as an audible signal from the loudspeaker (unless the volume setting is too low).

AUDIO CIRCUIT

This may be checked by injecting a signal into the Tape Input on the 'D' type Accessory connector on the Rear Panel.

Connect the output from the signal generator to pin 10 (Tape In/Out) of the 'D' connector, using pin 7 as the GND reference. Pin 9 (Tape In Select) should also be connected to pin 7. Set the signal generator output to give a 1kHz sinewave.

Set the volume to maximum (verified by checking that pins 2-7 of 1C23 are all low).

Using the oscilloscope, check the output measured across the loudspeaker for the following inputs:-

Input	Output across the loudspeaker
500mV pk-pk	240-360mV pk-pk
2V pk-pk	0.96-1.44V pk-pk
6V pk-pk	3.2-4.4V pk-pk

All the signals must be clean sine-waves with no visible distortion.

AGC NETWORK

With the signal generator connected as above, set the output to 400Hz.

Set the input voltage to 3V pk-pk, and connect the oscilloscope to ZD8 cathode (marked with a stripe). This should be a dc level of approximately +2.1V.

Rapidly decrease the input voltage to 1.0V pk-pk and the dc level at ZD8 should recover to 2.1V within 1 second.

Rapidly decrease the input voltage to 300mV pk-pk and the dc level at ZD8 should recover to 2.1V within 4 seconds.

Increase the input voltage to 3V pk-pk, the dc level at ZD8 should recover to 2.1V within 1 second.

TOCO CIRCUIT

Plug the Toco Transducer into the UA socket (yellow) on the Front Panel. Place the Transducer face up and flat on the bench and check the following signals with the DVM:

Toco Positive Excitation	PL6 pin 5	+5V +/- 0.2Vdc
Toco Negative Excitation	PL6 pin 6	-5V +/- 0.2Vdc
Toco Input	PL6 pin 7	+50 to +150mV

Place a 250gm weight on to the centre of the transducer and check the voltage at Pin 6 of IC24. This should be +0.93 to +1.73Vdc.

DIGITAL CIRCUITS

There are no specific tests applicable to the Digital Circuits. Due to the complexity of the digital computer circuit, checking is restricted to confirming that each device has the correct supply presented to it. However, below are a selection of key signals which, if not present will prevent the system from starting and operating.

IC33 - Max 691 Microprocessor Supervisor IC

Pin 1 - VBat
Pin 9 - PFI (input)
Pin 4 - 0V
Pin 3 - Vcc
Pin 2 - Vout (RAM supply)
Pin 12 - CEO (output to RAM)
Pin 13 - CEI (input from decode logic)

4.5 ULTRASOUND TRANSDUCER CALIBRATION

This procedure should be performed in the event of fitting a replacement Ultrasound transducer. It ensures that the transducer is optimised with the drive circuits on board. The following is performed with the instrument switched on and the Ultrasound Transducer plugged into the CARDIO socket on the Front Panel.

SETTING THE TRANSMITTER

Connect the oscilloscope to the junction of C52 and TR5/gate (D19 cathode or D20 anode). This should be a low level signal at approximately 2.1MHz.
Carefully adjust L1 so that the signal displayed on the oscilloscope is maximised. The amplitude should be greater than 100mV pk-pk

Check the frequency of the signal as at PL6 pin 1 with the frequency counter, this must be between 2.050 and 2.150 MHz). Connect the oscilloscope to PL6 pin 1 and adjust L2 to maximise the observed signal. Adjust VR2 to set the amplitude of the signal to 6V pk-pk.

ADJUSTING THE RECEIVER

Connect the oscilloscope to the cathode of D16 and adjust L3 and L4 so that the dc level displayed is peaked. This dc level must be greater than 12Vdc.
Note: It may be necessary to repeat the adjustments of L3/L4 as they are interactive.

4.6 TOCO TRANSDUCER CALIBRATION

The Toco Transducer requires no calibration. However in the event that the transducer requires replacing, then it will be necessary to register the residual offset of the transducer (tco) by following the set-up programme which is detailed earlier in this section.

SECTION 5

SAFETY TESTS

This section details the safety tests which should be performed on each instrument at regular intervals and after any repair which could affect the safety aspect of the unit.

5.1 TEST EQUIPMENT REQUIREMENTS

Rigel Safety Tester Model 233

5.2 SETTING UP

The electrical safety tester must be plugged into a standard power socket with a known good earth.

The unit to be tested is plugged into the IUT (Insrument Under Test) power outlet on the tester.

The applied parts - transducers type B, and transducers or scalp electrodes type BF, must be plugged into the applied part sockets at the top right hand corner of the tester via the 4mm plug to crocodile clip adaptors.

The probe/clip must be connected to the probe terminal on the tester and its use will be described in the appropriate sections.

5.3 OPERATION

The programme switch located at the bottom right corner of the tester should be set to the Class and Type of instrument to be tested.

All units are Class 1.
FETATRACK 210 and FETATRACK 260 Antepartum are Type B units.
FETATRACK 260 Intrapartum (ECG / IUP) is a Type BF unit.

Switch ON the Instrument Under Test via the Rear Panel POWER switch (and also the Front Panel switch on the FETATRACK 210).
All tests are carried out with the POWER switch on the Instrument Under Test ON.

Switch ON the Safety Tester.

Turn the test selector to 1 - TEST
All lamps on the Safety Tester must be lit and the meter needle must indicate within the test arc on the meter scale.

Turn the test selector to 2 - SUPPLY.
The 'MAINS' LED next to the meter is lit to indicate the scale to be read: the value must be in the range 200 to 260V.

Turn the test selector to 3 - MAINS PART
The Mohm scale is used for this test as indicated by the Ins Mohm LED adjacent to the meter, and the illuminated TEST button must be pressed to perform the test. The value must be greater than 1Mohm.

Turn the test selector to 4 - APPLIED PART (Type BF units only)
The Mohm meter scale is used for this test as indicated by the Ins Mohm LED, and the illuminated TEST button must be pressed to perform the test. The value must be greater than 10Mohm.

Turn the test selector to 5 - PROTECTIVE EARTH
Using the Clip/Probe, attach to (or hold firmly against) all parts listed below and press the TEST button.
As indicated by the adjacent LED, the RES. scale is in use. All values measured must be less than 0.2 ohms.

All case screws (front panel, rear panel, cover).
Front panel recorder aperture.
Recorder door earth stud.

Turn the test selector to 6 - EARTH LEAKAGE
The illuminated AP/GND switch must be pressed. The value must be less than 500uA.

Turn the test selector to 7 - EARTH LEAKAGE
The NORMAL/REVERSE switch must be used to interrupt each supply lead in turn. The illuminated AP/GND switch must be pressed in both NORMAL and REVERSE positions. The value must be less than 1000uA.

Turn the test selector to 8 - ENCLOSURE LEAKAGE
Using the Clip/Probe lead connect in turn to each of the exposed metal parts listed below. The value must be less than 100 uA.

All case screws (front panel, rear panel, cover).
Front Panel recorder aperture.
Recorder door earth stud.

Turn the test selector to 9 - ENCLOSURE LEAKAGE
Using the Clip/Probe lead, connect in turn to each of the exposed metal parts listed below. The value must be less than 500 uA.

All case screws (front panel, rear panel, cover).
Front Panel recorder aperture.
Recorder door earth stud.

Turn the test selector to 10 - ENCLOSURE LEAKAGE

Using the Clip/Probe lead connect in turn to each of the exposed metal parts listed below. Operate the NORMAL/REVERSE switch each time. The value obtained must be less than 500 uA.

All case screws (front panel, rear panel, cover).
Front Panel recorder aperture.
Recorder door earth stud.

Turn the test selector to 11 - PATIENT LEAKAGE
The value obtained must be less than 100uA.

Turn the test selector to 12 - PATIENT LEAKAGE
Operate the NORMAL/REVERSE switch. The values obtained must be less than 500uA.

Turn the test selector to 13 - PATIENT LEAKAGE
Operate the NORMAL/REVERSE switch. The values obtained must be less than 500uA.

Turn test selector to 14 - PATIENT AUXILIARY CURRENT
The value must be less than 10uA.

Turn the test selector to 15 - PATIENT AUXILIARY CURRENT
Operating the NORMAL/REVERSE switch. The values obtained must be less than 500uA.

Turn the test selector to 16 - PATIENT AUXILIARY CURRENT
Operate the NORMAL/REVERSE switch together with the lead selector switch. The value obtained must be less than 500uA

Turn the test selector to 17 - MAINS ON APPLIED PART (Type BF units only)
Operate the NORMAL/REVERSE switch and press TEST in each case. The value obtained must be less than 5000uA.

Turn the test selector to 18 - MAINS ON APPLIED PART (Type BF units only)
Operate the NORMAL/REVERSE switch and press TEST in each case. The value obtained must be less than 5000uA.

TESTS COMPLETE - TURN TEST SELECTOR TO 1 AND TURN SAFETY TESTER AND MONITOR OFF.

SECTION 6

FAULT FINDING

This section is an aid to trouble shooting and should be used in conjunction with the relevant circuit diagrams found at the rear of this manual (Section 10). In each case recalibration and safety checks must be carried out after any repair.

The following tables list some of the symptoms and the relevant circuit areas.

NOTE: DO NOT, UNDER ANY CIRCUMSTANCES ATTEMPT TO REPAIR THE INSRUMENT WHILST IT IS CONNECTED TO A PATIENT.

6.1 DIGITAL DISPLAY PROBLEMS

Symptom	Suspect Circuit or Section	Check
Power on but no displays illuminate. POWER ON LED is illuminated but no digital displays.	Ribbon cable interface from Main PCB to Display PCB. IC21 (PIA)	Connections at PL4. Signals (pulses) present at IC21pins 2-8 & 10-14.
FETATRACK 210 only Pressing Front Panel ON/OFF switch does not turn unit ON.	Unit on/off control - IC2A TR1 and TR2	Pin 3 goes low when switch pressed ; pin 1 changes state. TR1 and TR2 turn on when IC2A pin 1 goes high.

6.2 CHART RECORDER PROBLEMS

Symptom	Suspect Circuit Area	Check
Speed display flashes	Paper out sensor detected end of paper.	Paper out sense: IC22pin28=low for no paper, high when paper pack present.
Recorder does not feed paper but speed display illuminates.	Cables Printer power supply - TR9, IC4, TR3 Motor control - IC9, IC8	Connections on interface cables PL1 and PL2 Printhead voltage at P10 Motor strobe signals at IC8 pins 13 - 16.
Recorder feeds paper but does not print.	Printhead interface - IC9, IC7	Data and strobe pulses on IC7 pins 2, 4, 6, 10, 12.

	Printhead alignment. Printhead pressure.	Printhead fixing screws - if loose printhead will misalign. Realign using printer test trace; ensure screws are tight. Loose fixing screws in spring mounting bars, broken spring.
Misalignment of trace on chart paper.	Printhead lateral alignment.	Releasing the two M4 screws at rear of printhead mounting bracket allows lateral movement; re-tighten screws after adjustment.

6.3 ULTRASOUND

Symptom	**Suspect Circuit Area**	**Check**
Ultrasound does not function.	Transducer Mode detect circuit Ultrasound transmitter/ receiver	Try another transducer. IC28 pin 1 (P28) high, IC28 pin 16 (P31) high when transducer plugged in. Transmitter signal to transducer - PL6/1. Received signal after detection -IC29A pin 1 (P26): observable audio signal when transducer faceplate stroked.
Ultrasound signals OK but no audio.	Loudspeaker connections Mode selector - IC28 Digital volume control - IC23, IC32 Audio amplifier IC31	Check wires have not become detatched from loudspeaker terminals. Audio signal is present at IC28 pins 3, 2, 15, 14, 11. With volume at maximum, IC23 pins 2-7 should be low; audio signal should be present at IC32 pin 6. Input signal at IC31 pin 3 (P21). Ouput signal at IC31 pin 5.

6.4 UTERINE ACTIVITY (TOCO)

Symptom	Suspect Circuit or section	Check
UA pressure does not register on chart printout.	Toco Transducer	Replace transducer.
	Transducer excitation	+5Vdc at IC30 pin 1 (P41) and PL6 pin 5 -5Vdc at IC30 pin 7 (P42) and PL6 pin 6.
	Transducer output	PL6 pin 7 - should be +100mV +/- 50mV unloaded, increasing by 40mV/100gm load on transducer button. IC24 pin 6 - dc readings should be 4.9 x transducer output for FETATRACK 210, and 7.5 x transducer output for FETATRACK 260.

FETATRACK 260 only

The UA digital display will display the pressure provided that the analogue circuit is functioning correctly as above. The UA digital display is controlled by the system software and is dependant on the analogue input.

6.5 ECG (FETATRACK 260 only)

Symptom	Suspect Circuit or Section	Check
ECG does not function.	Leg clip connections	ECG Electrode connections to Leg clip. Continuity of leg clip terminals to plug contacts.
	ECG Enable - IC28	IC28 pin 1 is +5V.
	ECG PCB Assembly	Check overall functioning with ECG Simulator. Connect ECG Simulator to CARDIO input on monitor. Set output to 120BPM. Check ECG rate is displayed,

		output from loudspeaker and also printed correctly.

SECTION 7

RECOMMENDED SPARES

7.1 Recommended Spares

The following list is a list of recommended spares for the FETATRACK 210 and 260 series fetal monitors :-

Description	FETATRACK 210	FETATRACK 260
Ultrasound Transducer	0215-0003	0215-0003
TOCO Transducer	0211-0003	0211-0003
Leg Plate		0261-0005
Event Marker	0211-0004	0211-0004
Ultrasound Head assy.	0211-7001	0211-7001
TOCO Head assy.	0211-7002	0211-7002
Ultrasound Cable assy.	0215-8401	0215-8401
TOCO Cable assy.	0211-8405	0211-8405
Rechargeable Battery	0200-1067	
Lithium Battery	9020-4220	9020-4220
Main PCB assy	0211-8201	0260-8201
Display PCB assy.	0211-8202	0260-8202
ECG PCB assy		0260-8203
Transformer (mains) 220V	0211-3001	0211-3001
Transformer (mains) 110V	0211-3002	0211-3002
Fuses T200mA	6410-0200	6410-0200
Fuses T500mA	6410-0500	6410-0500
Fuses F2A	6420-2000	
Paper Out Sensor assy.	0211-8205	0211-8205
Drive Belts short	0211-1017	0211-1017
Drive Belts long	0211-1018	0211-1018
Thermal Printhead	6200-0803	6200-2005
Motor / Gearbox assy.	0211-7006	0211-7006

SECTION 8

PARTS LISTS

The following parts lists are included in this section :-

FETATRACK 210

Assembly Number	Description
0215-8101	FETATRACK 210 Front Panel Assemby
0215-8103	Cover Assembly
0215-8104	Recorder Assembly
0215-8107	Rear Panel Assembly
0215-8105	Chassis Assembly
0215-8106	Final Assembly
0211-8201	Main PCB Assembly
0211-8202	Display PCB Assembly
0211-8205	Paper Out Sensor Assembly
0211-0003	External TOCO Transducer
0215-0003	FETATRACK 210/260 Ultrasound Transducer

FETATRACK 260

Assembly Number	Description
0261-8101	FETATRACK 260 Front Panel Assembly
0261-8102	Rear Panel Assembly
0261-8103	Cover Assembly
0261-8104	Recorder Assembly
0261-8105	Chassis Assembly
0261-8107	Antenatal Final Assembly
0261-8109	Intrapartum Final Assembly
0211-0003	External TOCO Transducer
0215-0003	FETATRACK 210/260 Ultrasound Transducer
0261-0005	FETATRACK 260 Leg Plate
0260-8201	Main PCB Assembly
0260-8202	Display PCB Assembly
0260-8203	ECG PCB Assembly

0215-8101 FETATRACK 210 FRONT PANEL ASSEMBLY

0211-1001	FETATRACK 210 Front Panel	1	
0211-1508	FETATRACK 210 Front Panel Overlay (Embossed)	1	
0211-8202	FETATRACK 210 Display PCB Assy	1	
5212-1010	Harwin Housing 10 Way	1	
5250-1000	Harwin Crimps	9	
5621-4012	Nicolay socket 12 way Yellow 202 290	1	
5621-6012	Nicolay Socket 12 way Blue 108 510.16	1	
5631-5012	Nicolay Contact Female (Skt) 320604	9	
5640-0250	Spade Terminal Post	1	
5650-0250	Spade Crimp size 250	2	
7000-0100	Wire 7/0.2 Single White		260
7000-1000	Wire 7/0.2 Single Black	255	
7000-5000	Wire 7/0.2 Single Yellow	85	
7000-7000	Wire 7/0.2 Single Blue	85	
7020-0300	Wire 16/30 Single Y/Gn UL1007	620	
7064-0174	Wire Coaxial RG174	170	
7072-0032	Heatshrink Tube 3.2mm diam.	100	
7124-1300	Nut Stainless Full M3	13	
7126-1300	Washer Stainless Plain M3	12	
7157-1300	M3 Shakeproof Washer	13	
7159-6032	M3 Nylon Washer	1	
7213-0030	M3x6 Spacer Brass	4	

0215-8103 FETATRACK 210 COVER ASSEMBLY

0210-1400	FM210 Handle Set	1
0215-1002	FETATRACK 210 Cover	1
5650-0250	Spade Crimp size 250	1
5670-0004	Eyelets Insulated Crimp M4	1
7020-0300	Wire 16/30 Single Y/Gn UL1007	200
7124-1500	Nut Stainless Full M4	1
7153-1512	Screw Stainless CSK M4x12mm	2
7157-1500	M4 Shakeproof Washer	1

0215-8104 FETATRACK 210 RECORDER ASSEMBLY

0215-1003	FETATRACK 210 Printer Door	1
0211-1008	FETATRACK 210 Papertray	1
0211-1010	FETATRACK 210 Printhead Spring	1
0211-1015	AFM 210 Recorder Roller	1
0211-1016	AFM 210 Gearbox Drive Gear	1
0211-1017	Recorder Drive Belt (short)	1
0211-1018	Recorder Drive Belt (long)	1
0211-1019	Pivot Pin	2
0211-1021	AFM 210 Printer Door Pivot Spindle	1
0211-1022	AFM 210 Printer Roller Spindle	1
0211-1023	AFM 210/FM 260 Drive Gear	1
0211-1026	Idler Gear (small)	1
0211-1027	Paper Peel Bar (AFM 210)	1

0211-1028	Recorder Pivot Block LHS	1
0211-1029	Recorder Pivot Block RHS	1
0211-1030	Paper Guide Washer LHS	1
0211-1031	Paper Guide Washer RHS	1
0211-1032	AFM 210 Recorder Chassis	1
0211-1039	Spring Mounting Bar	1
0211-1040	Mounting Bar	1
0211-1041	Pressure Bar	1
0211-8205	Paper out sensor PCB assy	1
0260-1034	Printhead Pivot Block	2
0260-1038	Recorder Head Pressure Spring	2
3612-1001	Stepper Motor 12V and Gearbox	1
5211-1010	Harwin Housing 10 way	1
5250-1000	Harwin Crimps	6
5650-0250	Spade Crimp size 250	1
5670-0004	Eyelets Insulated Crimp M4	3
6200-0803	Thermal Printhead KE0803-A1	1
7020-0300	Wire 16/30 Single Y/Gn UL1007	480
7124-1300	Nut Stainless Full M3	2
7124-1500	Nut Stainless Full M4	2
7126-1300	Washer Stainless Plain M3	13
7126-1500	Washer Stainless Plain M4	5
7126-1800	Washer Stainless Plain M10 (Form B)	1
7149-1306	Screw Socket Set M3x6mm	6
7151-1306	Screw Stainless PAN M3x6mm	9
7151-1510	Screw Stainless PAN M4x10mm	2
7153-1306	Screw Stainless CSK M3x6mm	4
7153-1310	Screw Stainless CSK M3x10mm	4
7157-1300	M3 Shakeproof Washer	11
7157-1500	M4 Shakeproof Washer	4
7159-6040	2.5mm Nylon Roller	2
7245-0004	Spacer Brass Plain M4x4mm	2
7400-0001	Tyrap short Type PLT1M	7
7400-0028	Tyrap long Type TY28M (Bulk order code)	1
7705-0032	E Clip M3.2 (1500-3.2)	8

0215-8105 FETATRACK 210 CHASSIS ASSEMBLY

0215-1001	FETATRACK 210 Base	1
0211-1014	FETATRACK 210 Front Panel Bracket	1
0211-3001	Mains Transformer 240Vac	1
0211-3002	*Mains Transformer for 110V Variant*	*1*
0215-8101	FETATRACK 210 Front Panel Assembly	1
0215-8103	FETATRACK 210 Recorder Assembly	1
0215-8102	FETATRACK 210 Rear Panel Assembly	1
0211-8201	FETATRACK 210 Main PCB Assembly	1
5355-0025	“D” Type Cover (25 way)	1
5355-2130	Screwlock Assy (5mm Female)	2
5650-0187	Spade Crimp size 187	2
6410-0200	Fuse Time Delay 200mA	2

6410-0500	*500mA Fuses for 110V Variant*	*2*	
7126-1300	Washer Stainless Plain M3	19	
7126-1500	Washer Stainless Plain M4	2	
7147-4425	Screw Stainless Pozi PAN UNC 4-40 x 1/4	2	
7151-1306	Screw Stainless PAN M3x6mm	7	
7151-1308	Screw Stainless PAN M3x8mm	6	
7151-1312	Screw Stainless PAN M3x12mm	12	
7157-1300	M3 Shakeproof Washer	17	
7159-6032	M3 Nylon Washer	2	
7300-0211	Feet Tilting (set 4)	1	
7400-0001	Tyrap Short Type PLT1M	14	
7900-0011	Double Sided Tape Pads		2

0215-8107 FETATRACK 210 REAR PANEL ASSEMBLY

0211-1002	FETATRACK 210 Rear Panel	1	
0211-1048	Loudspeaker Gasket	1	
0215-1502	Rear Panel Overlay - Multi Voltage	1	
5110-0000	Inlet Mains IEC Dual Fused	1	
5640-0250	Spade Terminal Post	2	
5650-0187	Spade Crimp size 187	5	
5660-0003	Eyelet Crimp M3	1	
6111-0000	Switch Rocker Mains	1	
6540-0077	Loudspeaker Round 80mm (ATO 80MO)	1	
7020-0300	Wire 16/30 Single Y/Gn UL1007	160	
7020-2000	Wire 16/30 Single Brown UL1007	105	
7020-7000	Wire 16/30 Single Blue UL1007		100
7124-1300	Nut Stainless Full M3	5	
7126-1300	Washer Stainless Plain M3	9	
7151-1306	Screw Stainless PAN M3x6mm	4	
7157-1300	M3 Shakeproof Washer	9	

0215-8106 FETATRACK 210 FINAL ASSEMBLY

0215-0002	Ultrasound Transducer	1
0211-0003	External Toco Transducer	1
0215-8104	FETATRACK 210 Cover Assy	1
0215-8105	FETATRACK 210 Chassis Assy	1
7126-1500	Washer Stainless Plain M4	4
7151-1516	Screw Stainless PAN M4x16mm	4
7157-1500	M4 Shakeproof Washer	4

0211-0003 EXTERNAL TOCO TRANSDUCER

0210-3276	Cable Clamp	1
0210-3232	Transducer Housing	1
0211-1511	Serial Number Label	1
0211-1513	Transducer Label	1
0211-7001	TOCO Transducer Head Assembly	1
0211-8405	TOCO Transducer Cable Assembly	1
7153-1105	Screws Stainless M2 x 5mm CSK	2

0215-0003 FETATRACK 210 / 260 ULTRASOUND TRANSDUCER

0210-3232	Transducer Housing	1
0211-1510	Serial Number Label	1
0211-1512	Transducer Label	1
0211-7001	Ultrasound Transducer Head Assembly	1
0215-8401	FETATRACK 210/260 U/Sound Cable Assembly	1

0211-8201 FETATRACK 210 MAIN PCB ASSEMBLY

0200-1067	Rechargeable Battery 9.6V BP1,2,3	3
0211-2001	FETATRACK 210 Main PCB Issue 4	1
0211-8401	Printhead Ribbon Cable Assy PL1	1
1101-0010	Resistor LR1 1% 1R R70	1
1101-0100	Resistor LR1 1% 10R R28,50,94	3
1101-0101	Resistor LR1 1% 100R R53	1
1101-010	Resistor LR1 1% 1KO R56,58,88,95	4
1101-0103	Resistor LR1 1% 10K R16,17,22-24,36,41,42,47,60,61,72-4,81,85,89,90	18
1101-0104	Resistor LR1 1% 100K R27,40,44,45,55	5
1101-0105	Resistor LR1 1% 1MO R4,43,46,62,79,80,91,92	8
1101-0121	Resistor LR1 1% 120R R11,68	2
1101-0122	Resistor LR1 1% 1K2 R12,82	2
1101-0124	Resistor LR1 1% 120K R6	1
1101-0152	Resistor LR1 1% 1K5 R49,ZD1	2
1101-0153	Resistor LR1 1% 15K R8,13,65	3
1101-0184	Resistor LR1 1% 180K R5	1
1101-0203	Resistor LR1 1% 20K R64	1
1101-0220	Resistor LR1 1% 22R R71	1
1101-0223	Resistor LR1 1% 22K R35,38	2
1101-0224	Resistor LR1 1% 220K R51,52,54,57	4

1101-0273	Resistor LR1 1% 27K R48,67	2	
1101-0304	Resistor LR1 1% 300K R26	1	
1101-0333	Resistor LR1 1% 33K R39	1	
1101-0392	Resistor LR1 1% 3K9 R83	1	
1101-0470	Resistor LR1 1% 47R R1	1	
1101-0471	Resistor LR1 1% 470R R66	1	
1101-0472	Resistor LR1 1% 4K7 R9,18,59	3	
1101-0473	Resistor LR1 1% 47K R37	1	
1101-0511	Resistor LR1 1% 510R R76,96	2	
1101-0512	Resistor LR1 1% 5K1 R63	1	
1101-0514	Resistor LR1 1% 510K R19	1	
1101-0560	Resistor LR1 1% 56R R69	1	
1101-0622	Resistor LR1 1% 6K2 R14	1	
1101-0754	Resistor LR1 1% 750K R2,3	2	
1101-3092	Resistor LR1 1% 3k09 R15	1	
1430-0102	Multiturn Pot. 1K VR1	1	
1430-0202	Multiturn Pot. 2K VR2	1	
1500-0103	Resistor Network SIL 10K RP1	1	
1903-0020	Resistor Hi-Watt 5% 2R R10		1
2230-0106	Electrolytic 10uF 16V 509D C60,86	2	
2230-0107	Electrolytic 100uF 16V 509D C7,21,27,28,35,65,69,71,81,82	10	
2230-0108	Electrolytic 1000uF 16V 509D C36	1	
2230-0227	Electrolytic 220uF 16V 509D C14,15,70	3	
2230-0476	Electrolytic 47uF 16V 509D C40,66	2	
2230-0477	Electrolytic 470uF 16V 509D	2	

	C57,59	
2250-0108	Electrolytic 1000uF 50V SU C1,2,10	3
2250-0474	Electrolytic 0.47uF 50V C55	1
2250-0478	Electrolytic 4700uF 50V TSU C8	1
2260-0225	Electrolytic 2.2uF 63V 509D C5,13,37	3
2330-0106	Tantalum 10uF 16V 499D C44	1
2350-0105	Tantalum 1uF 35V 499D C9,91	2
2564-0228	Polyester 10% 220nF C62,63,68	3
2564-0229	Polyester 10% 22nF C4,12,42	3
2564-0478	Polyester 10% 470nF C16,39,41	3
2770-0102	Ceramic Axial 1000pF 50/100V C58	1
2770-0122	Ceramic Axial 1200pF 50/100V C45,48	2
2770-0189	Ceramic plate 18pF C19,20,22,VC1	4
2770-0221	Ceramic Axial 220pF 50/100V C46,52	2
2770-0330	Ceramic Axial 33pF 50/100 C75	1
2770-0339	Ceramic Plate 33pF C23,24	2
2770-0472	Ceramic Axial 4700pF 50/100V C38,54,67	3
2770-0681	Ceramic Axial 680pF 50/100V C51,53	2
2870-0103	Ceramic Radial 10nF 100V C17,18,47	3
2870-0104	Ceramic Radial 100nF 100V C3,11,25-6,29,32-4,43,49,50,56,64,72-4,76,90, DC1-2,4-7,12	25
2870-0152	Ceramic Radial 1n5 50V C6	1
3005-0838	Inductor 5S 0838 Toko L3	1
3005-0841	Inductor 5S 0841 Toko L1	1
3005-0842	Inductor 5S 0842 Toko L4	1

3005-0876	Inductor 5S 0876 Toko L2	1	
3025-0625	Ferrite Core (Ring) 25mm MM625T2/T3 T3=36T bifilar; T2=36T	2	
4110-0085	Diode BAT85 D16	1	
4120-4148	Diode 1N4148 D7,8,9,10,11,13,14,15,17,18,	12	
4130-0027	Diode BYV27-50 D4,5,6	3	
4130-4000	Diode 1N4000 Series D1,2,12	3	
4140-0047	Diode Zener BZX79 C4V7 ZD10	1	
4140-0051	Diode Zener BZX79 B5V1 2% ZD3,4,5,6,8,9	6	
4140-0120	Diode Zener BZX79 C12V ZD2,7	2	
4150-0202	Diode Bridge SKB202L5A 1.6A BR 1		1
4210-0182	Transistor BC182 TR1,5	2	
4210-0183	Transistor BC183C TR8	3	
4220-2955	Transistor TIP2955 TR3	1	
4230-0256	FET M-Type BF256A TR4,6,7	3	
4250-0810	FET V-Type MTP8P10 TR2,9	2	
4310-0071	Analogue IC - TL071CP IC24,32	2	
4310-0072	Analogue IC - TL072CP IC26,27,29	3	
4310-0820	Analogue IC - TBA820M IC31	1	
4310-1455	Analogue IC - MC1455 P1 IC6	1	
4310-1458	Analogue IC - MC1458 CP IC30	1	
4310-6270	Analogue IC - SL 6270C IC25	1	
4320-2003	High Current Driver ULN2003 IC8	1	
4320-4013	CMOS D-Type Flip-Flop MC14013 IC2	1	
4320-4049	CMOS Hex Buffer MC14049 IC7	1	
4320-5406	CMOS RS232 Interface MC145406	1	

	IC16	
4321-0000	CMOS Dual and Gate MC74HC00 IC14	1
4321-0002	CMOS Dual Nor Gate MC74HC02 IC15	1
4321-0008	CMOS Dual and Gate MC74HC08 IC19	1
4321-0138	CMOS 1-8 Decoder MC74HC138 IC18	1
4330-0691	Watch Dog I.C. MAX 691CPE IC33	1
4330-6309	CMOS Microprocessor HD63BO9P IC10	1
4330-6321	CMOS Microprocessor HD63B21P IC21	1
4330-6522	Microprocessor - R65C22 AP IC9	1
4330-6551	CMOS RS232 Controller MD65SC51 IC17	1
4330-7170	CMOS Real Time Clock ICM7170 IC13	1
4340-2256	CMOS Memory HM62256LP IC12	1
4340-7128	CMOS EProm HM27C128 (Programmed) IC11	1
4350-4960	Regulator Switch Mode L4960 IC3,5	2
4360-0317	Voltage Regulator LM 317T IC1,4	2
4360-7004	A/D Converter uPD7004 IC22	1
4360-7118	Digital Audio Attenuator AD7118KN IC23	1
4360-7905	Voltage Regulator MC 79L05 IC20	1
4370-0212	Analogue Switch DG212 IC28	1
4510-0032	Crystal Micro Watch 32.768kHz XTL2	1
4510-0184	Crystal Micro H18U 1.843MHz XTL3	1
4510-0800	Crystal Micro H18U 8MHz XTL1	1
5212-1010	Harwin Wafer 10 Way PL2,PL6	2
5313-0020	IDC Straight PCB Box Header 20 way PL4	1
5354-0025	M50 'D' Connector Plastic 25way Female PL3	1

5404-2010	Jack Socket 1/4 in Mono P.C.B. PL7	1	
5650-0250	Spade Crimp size 250 Signal Return	1	
5910-0016	IC Socket Turn Pin 16 way IC7,8	2	
5910-0024	IC Socket Turn Pin 24 way IC13	1	
5910-0028	IC Socket Turn Pin 28 way IC11,12,17	3	
5910-0040	IC Socket Turn Pin 40 way IC9,10,21	3	
5910-1028	IC Socket Turn Pin 14 way strip	2	
6310-2307	Fuse Clip P.C.B. 20mm	1	
6420-2000	Fuse Fast Blow 2A F1	1	
6610-0221	Heatsink T0220 High Efficiency I.C. 4 Mounting		1
7000-1000	Wire 7/0.2 Single Black	155mm	
7000-3000	Wire 7/0.2 Single Red	90mm	
7000-9000	Wire 7/0.2 Single Grey	105mm	
7124-1300	Nut Stainless Full M3	3	
7126-1300	Washer Stainless Plain M3	3	
7151-1308	Screw Stainless PAN M3x8mm	1	
7151-1310	Screw Stainless PAN M3x10mm	2	
7157-1300	M3 Shakeproof Washer	3	
7159-6032	M3 Nylon Washer IC4 Mounting	2	
7400-0001	Tyrap short Type PLT1M 0v strap	1	
7400-0028	Tyrap long Type TY28M (Bulk order code) BP1,2,3	3	
7500-0220	Transistor Mounting Kit T0 220 I.C.4 mounting	1	
7900-0011	Double Sided Tape Pads BP1,2,3: Three per Battery Pack		9
9020-4220	Lithium Battery 40LH220 BP4,5	2	

0211-8202 FETATRACK 210 DISPLAY PCB ASSEMBLY

0211-2002	FETATRACK 210 Display PCB	1
0211-8402	Display Ribbon Cable Assy PL1	1
1101-0103	Resistor LR1 1% 10K R4,5,6,7	4
1101-0105	Resistor LR1 1% 1MO R 8	1

1101-0181	Resistor LR1 1% 180R R9,10,11,12,13,14,15	7
1101-0560	Resistor LR1 1% 56R R17	1
1101-0681	Resistor LR1 1% 680R R3	1
1101-0822	Resistor LR1 1% 8K2 R1,2,16	3
2230-0107	Electrolytic 100uF 16V 509D C1	1
2870-0104	Ceramic Radial 100nF 100V C2	1
4120-4148	Diode 1N4148 D1,2,3,4	4
4220-0751	Transistor ZTX 751 TR1,2,3,4	4
4320-2003	High Current Driver ULN2003 IC1,2	2
4410-2855	Led Single Green HLMP 2855 LED 1	1
4410-3124	Led Single Yellow HLMP-T300 LED 2,3	2
4410-4124	Led Single Green HLMP-T500 LED 9	1
4420-5601	LED 7 Segment - HDSP 5601 LED 5,6,7,8	4
6120-0001	PCB mount switch Sw0,1,2,3,4	5

0211-8205 PAPER OUT SENSOR PCB ASSEMBLY

0211-2005	Paper Out Sensor PCB	1
1101-0103	Resistor LR1 1% 10K R2	1
1101-0391	Resistor LR1 1% 390R R1	1
4440-0900	SFH900-2 Reflection emitter/sensor TR1	1
5250-1000	Harwin Crimps	3
7000-1000	Wire 7/0.2 Single Black	180
7000-3000	Wire 7/0.2 Single Red	180
7000-4000	Wire 7/0.2 Single Orange	180

FETATRACK 260 PARTS LISTS

0261-8101 FETATRACK 260 FRONT PANEL ASSEMBLY

0260-1001	Front Panel	1
0261-1501	FETATRACK 260 Front Overlay (Embossed)	1
0260-8202	Display pcb assy	1
5212-1010	Harwin Housing 10 Way	2
5250-1000	Harwin Crimps	16

5621-4012	Nicolet socket 12 way Yellow 202290	1
5621-6012	Nicolet Socket 12 way Blue 108510.16	1
5631-5012	Nicolay Contact Female (Skt) 320604	16
5640-0250	Spade Terminal Post	1
5650-0250	Spade Crimp size 250	2
7000-0100	Wire 7/0.2 Single White	470
7000-1000	Wire 7/0.2 Single Black	360
7000-3000	Wire 7/0.2 Single Red	230
7000-4000	Wire 7/0.2 Single Orange	125
7000-5000	Wire 7/0.2 Single Yellow	85
7000-7000	Wire 7/0.2 Single Blue	85
7000-9000	Wire 7/0.2 Single Grey	125
7020-0300	Wire 16/30 Single Y/Gn UL1007	640
7064-0174	Wire Coaxial RG174	175
7072-0032	Heatshrink tube 3.2mm diam.	100
7124-1300	Nut Stainless Full M3	13
7126-1300	Washer Stainless Plain M3	12
7157-1300	M3 Shakeproof Washer	13
7159-6032	M3 Nylon Washer	1
7213-0030	Spacer Plated Brass Plain M3x6	4

0261-8103 FETATRACK 260 COVER ASSEMBLY

0261-1002	FETATRACK 260 Cover	1
5650-0250	Spade Crimp size 250	1
5670-0004	Eyelets Insulated Crimp M4	1
7020-0300	Wire 16/30 Single Y/Gn UL1007	200
7124-1500	Nut Stainless Full M4	1
7157-1500	M4 Shakeproof Washer	1

0261-8104 FETATRACK 260 RECORDER ASSEMBLY

0211-1016	Gearbox Drive Gear	1
0211-1017	Recorder Drive Belt (short)	1
0211-1018	Recorder Drive Belt (long)	1
0211-1019	Pivot Pin	2
0211-1023	Drive Gear	1
0211-1026	Idler Gear (small)	1
0211-1028	Recorder Pivot Block LHS	1
0211-1029	Recorder Pivot Block RHS	1
0211-1030	Paper Guide Washer LHS	1
0211-1031	Paper Guide Washer RHS	1
0211-8205	Paper out sensor PCB assy	1
0261-1003	FETATRACK 260 Door	1
0260-1008	Papertray	1
0260-1010	Printhead Spring	1
0260-1015	Recorder Roller	1
0260-1021	Recorder Door Pivot Spindle	1
0260-1022	Roller Spindle	1
0260-1027	Paper Peel Bar	1
0260-1032	Recorder Chassis	1

0260-1033	Printhead Packing Piece	1	
0260-1034	PrintheadPivot Block	2	
0260-1035	Recorder Spring Mounting Bar	1	
0260-1036	Recorder Mounting Bar	1	
0260-1037	Recorder Pressure Bar	1	
0260-1038	Recorder Head Pressure Spring	2	
3612-1001	Stepper Motor 12V and Gearbox	1	
5211-1010	Harwin Housing 10 way		1
5250-1000	Harwin Crimps	6	
5650-0250	Spade Crimp size 250	1	
5670-0004	Eyelets Insulated Crimp M4	2	
6200-2005	Thermal Printhead KE2005-B1	1	
7020-0300	Wire 16/30 Single Y/Gn UL1007	480	
7124-1300	Nut Stainless Full M3	2	
7124-1500	Nut Stainless Full M4	2	
7126-1300	Washer Stainless Plain M3	11	
7126-1500	Washer Stainless Plain M4	4	
7126-1800	Washer Stainless Plain M10	1	
7149-1306	Screw Socket Set M3x6mm	6	
7151-1306	Screw Stainless PAN M3x6mm	2	
7151-1308	Screw Stainless PAN M3x8mm	7	
7151-1510	Screw Stainless PAN M4x10mm	2	
7153-1308	Screw Stainless CSK M3x8mm	4	
7153-1310	Screw Stainless CSK M3x10mm	4	
7157-1300	M3 Shakeproof Washer	11	
7157-1500	M4 Shakeproof Washer	4	
7159-6040	2.5mm Nylon Roller	2	
7245-0004	Spacer Brass Plain M4x4mm	2	
7400-0001	Tyrap short Type PLT1M	7	
7400-0028	Tyrap long Type TY28M (Bulk order code)	1	
7705-0032	E Clip M3.2 (1500-3.2)	8	

0261-8102 FETATRACK 260 REAR PANEL ASSEMBLY

0260-1002	Rear Panel	1
0261-1502	FETATRACK 260 Rear Overlay	1
5110-0000	Inlet Mains IEC Dual Fused	1
5640-0250	Spade Terminal Post	2
5650-0187	Spade Crimp size 187	5
5670-0003	Eyelet Insulated Crimp M3	1
6111-0000	Switch Rocker Mains	1
6540-0077	Loudspeaker round 80mm (AT080M)	1
7020-0300	Wire 16/30 Single Y/Gn UL1007	160
7020-2000	Wire 16/30 Single Brown UL1007	105
7020-7000	Wire 16/30 Single Blue UL1007	100
7124-1300	Nut Stainless Full M3	5
7126-1300	Washer Stainless Plain M3	9
71561-1306	Screw Stainless PAN M3x6mm	4
7157-1300	M3 Shakeproof Washer	9

0261-8105 FETATRACK 260 CHASSIS ASSEMBLY

0211-1014	Front Panel Bracket	1
0211-3001	Mains Transformer 240Vac	1
(0211-3002	*Mains Transformer for 110V Versions)*	
0261-1001	FETATRACK 260 Base	1
0261-8101	FETATRACK 260 Front Panel Assy	1
0261-8103	FETATRACK 260 Recorder Assy	1
0261-8102	FETATRACK 260 Rear Panel Assy	1
0260-8201	Main PCB Assy	1
5355-0025	D Type Cover (25 way)	1
5355-2130	Screwlock Assy (5mm Female)	2
5640-0187	Spade Crimp Size 187	2
6410-0200	Fuse Time Delay 200mA	2
(6410-0500	*Fuses for 110V Versions)*	
7124-1300	Nut Stainless Full M3	2
7126-1300	Washer Stainless Plain M3	19
7126-1500	Washer Stainless Plain M4	2
7147-4425	Screw Stainless Pozi PAN UNC 4-40 x 1/4	2
7151-1306	Screw Stainless PAN M3x6mm	7
7151-1308	Screw Stainless PAN M3x8mm	6
7151-1312	Screw Stainless PAN M3x12mm	12
7157-1300	M3 Shakeproof Washer	21
7159-6032	M3 Nylon Washer	2
7300-0211	Feet Tilting (set 4)	1
7400-0001	Tyrap short Type PLT1M	16
7400-0036	Cable Tie Base (self adhesive)	2
7612-0100	Card Guide 100mm M3 fixing	2
7900-0011	Double Sided Tape Pads	2

0261-8107 FETATRACK 260 ANTEPARTUM FINAL ASSEMBLY

0215-0002	Ultrasound Transducer	1
0211-0003	External Toco Transducer	1
0260-8104	FETATRACK 260 Cover Assy	1
0261-8105	Chassis Assy	1
7126-1500	Washer Stainless Plain M4	4
7151-1308	Screw Stainless PAN M3x8mm	2
7151-1516	Screw Stainless PAN M4x16mm	4
7157-1500	M4 Shakeproof Washer	4

0261-8109 FETATRACK 260 INTRAPARTUM FINAL ASSEMBLY

0215-0003	Ultrasound Transducer	1
0211-0003	External Toco Transducer	1
0261-8104	Cover Assy	1
0261-8105	Chassis Assy	1
0260-8203	E.C.G. PCB Assy	1
7124-1300	Nut Stainless Full M3	1
7126-1300	Washer Stainless Plain M3	1
7126-1500	Washer Stainless Plain M4	4
7151-1312	Screw Stainless PAN M3x12mm	1
7151-1516	Screw Stainless PAN M4x16mm	4
7157-1300	M3 Shakeproof Washer	1

7157-1500	M4 Shakeproof Washer	4

0211-0003 EXTERNAL TOCO TRANSDUCER

0210-3276	Cable Clamp	1
0210-3232	Transducer Housing	1
0211-1511	Serial Number Label	1
0211-1513	Transducer Label	1
0211-7001	TOCO Transducer Head Assembly	1
0211-8405	TOCO Transducer Cable Assembly	1
7153-1105	Screws Stainless M2 x 5mm CSK	2

0215-0003 FETATRACK 210 / 260 ULTRASOUND TRANSDUCER

0210-3232	Transducer Housing	1
0211-1510	Serial Number Label	1
0211-1512	Transducer Label	1
0211-7001	Ultrasound Transducer Head Assembly	1
0215-8401	FETATRACK 210/260 U/Sound Cable Assembly	1

0261-0005 FETATRACK 260 LEG PLATE

0260-1040	Plate	1
0260-1041	Connector Box	1
0260-1508	Label	1
5620-6012	Nocolay Free Plag 12 Way Blue	1
5630-4012	Nicolay Contact Male	4
5670-0003	Eyelet M3 Crimp	1
5710-0001	Spring Action Terminal - Black	1
5710-0002	Spring Action Terminal - Red	1
5900-0002	Patient Lead LL-2-3120-8	1
7071-0030	Helsin Sleeve 3mm	2
7124-1300	Full Nut M3	1
7126-1300	Washer Stainless Plain M3	1
7153-1310	Screw Stainless M3 x 10mm CSK	2
7153-1312	Screw Stainless M3 x 12mm CSK	4
7157-1300	M3 Shakeproff Washer	1
7441-3332	Grommet Extended Black	1
7711-3001	Sonicloc Brass Insert M3	2

0260-8201 MAIN PCB ASSEMBLY

0211-2001	Main PCB Issue 4	1
0211-8401	Printhead Ribbon Cable Assy	1
0260-2004	Printhead Adapter PCB PL1 when connected with 0211-8401 and 5344-0034	1
1101-0010	Resistor LR1 1% 1R R70	1
1101-0100	Resistor LR1 1% 10R R28,50,94	3
1101-0101	Resistor LR1 1% 100R R53	1
1101-010	Resistor LR1 1% 1KO	5

	R56,58,76,88,95	
1101-0103	Resistor LR1 1% 10K R5,16,17,22-24,36,41,42,47,60,61,72-4,81,85,86,89,90	20
1101-0104	Resistor LR1 1% 100K R27,40,44,45,55,98	6
1101-0105	Resistor LR1 1% 1MO R4,43,46,62,79,80,91,92	8
1101-0121	Resistor LR1 1% 120R R11,68	2
1101-0122	Resistor LR1 1% 1K2 R12,82	2
1101-0152	Resistor LR1 1% 1K5 R49,ZD1	2
1101-0153	Resistor LR1 1% 15K R8,13,65	3
1101-0203	Resistor LR1 1% 20K R64	1
1101-0220	Resistor LR1 1% 22R R71	1
1101-0223	Resistor LR1 1% 22K R35,38	2
1101-0224	Resistor LR1 1% 220K R51,52,54,57	4
1101-0273	Resistor LR1 1% 27K R48,67	2
1101-0304	Resistor LR1 1% 300K R26	1
1101-0333	Resistor LR1 1% 33K R39,84	2
1101-0392	Resistor LR1 1% 3K9 R83	1
1101-0471	Resistor LR1 1% 470R R66	1
1101-0472	Resistor LR1 1% 4K7 R9,18,59	3
1101-0473	Resistor LR1 1% 47K R37	1
1101-0511	Resistor Metal Film 1% 510R R76,96	2
1101-0514	Resistor LR1 1% 510K R19	1
1101-0560	Resistor LR1 1% 56R R69	1
1101-0622	Resistor LR1 1% 6K2 R14	1
1101-0754	Resistor LR1 1% 750K R2,3	2
1101-3092	Resistor LR1 1% 3k09 R15,63	2

1430-0102	Multiturn Pot. 1K VR1	1
1430-0202	Multiturn Pot. 2K VR2	1
1500-0103	Resistor Network SIL 10K RP1	1
1903-0020	Resistor Hi-Watt 5% 2R R10	1
2230-0106	Electrolytic 10uF 16V 509D C60,86	2
2230-0107	Electrolytic 100uF 16V 509D C21,27,28,35,65,69,71,81,82	9
2230-0108	Electrolytic 1000uF 16V 509D C36	1
2230-0227	Electrolytic 220uF 16V 509D C14,15,70	3
2230-0476	Electrolytic 47uF 16V 509D C40,66	2
2230-0477	Electrolytic 470uF 16V 509D C57,59	2
2231-0477	Electrolytic 470uF 16V Low ESR C7	1
2250-0108	Electrolytic 1000uF 50V SU C1,2,10	3
2250-0474	Electrolytic 0.47uF 50V C55	1
2250-0478	Electrolytic 4700uF 50V TSU C8	1
2250-0109	Electrolytic 10000uF 50V CX	1
2260-0225	Electrolytic 2.2uF 63V 509D C5,13,37	3
2330-0106	Tantalum 10uF 16V 499D C44	1
2350-0105	Tantalum 1uF 35V 499D C9,91	2
2564-0228	Polyester 10% 220nF C62,63,68	3
2564-0229	Polyester 10% 22nF C4,12,42	3
2564-0478	Polyester 10% 470nF C39,41	2
2564-0479	Polyester 10% 47nF C80	1
2770-0102	Ceramic Axial 1000pF 50/100V C58	1
2770-0122	Ceramic Axial 1200pF 50/100V C45,48	2
2770-0189	Ceramic plate 18pF	4

	C19,20,22,VC1		
2770-0221	Ceramic Axial 220pF 50/100V	2	
	C46,52		
2770-0330	Ceramic Axial 33pF 50/100	1	
	C75		
2770-0339	Ceramic Plate 33pF	2	
	C23,24		
2770-0472	Ceramic Axial 4700pF 50/100V	3	
	C38,54,67		
2770-0681	Ceramic Axial 680pF 50/100V	2	
	C51,53		
2870-0103	Ceramic Radial 10nF 100V	3	
	C17,18,47		
2870-0104	Ceramic Radial 100nF 100V	24	
	C3,11,25-6,29,32-4,43,49,50,56,64,72-4,76,90,R87		
	DC1-2,4-7,12		
2870-0152	Ceramic Radial 1n5 50V	1	
	C6		
3005-0838	Inductor 5S 0838 Toko	1	
	L3		
3005-0841	Inductor 5S 0841 Toko	1	
	L1		
3005-0842	Inductor 5S 0842 Toko	1	
	L4		
3005-0876	Inductor 5S 0876 Toko	1	
	L2		
3025-0625	Ferrite Core (Ring) 25mm MM625T2/T3	2	
	T3=36T bifilar; T2=36T		
4110-0085	Diode BAT85	1	
	D16		
4120-4148	Diode 1N4148	12	
	D7,8,9,10,11,13,14,15,17,18,19,20		
4130-0027	Diode BYV27-50	3	
	D4,5,6		
4140-0047	Diode Zener BZX79 C4V7	1	
	ZD10		
4140-0051	Diode Zener BZX79 B5V1 2%	7	
	ZD3,4,5,6,8,9,12		
4140-0120	Diode Zener BZX79 C12V	2	
	ZD2,7		
4150-0202	Diode Bridge SKB202L5A 1.6A		1
	BR 1		
4210-0182	Transistor BC182	1	
	TR5		
4210-0183	Transistor BC183C	3	
	TR8		
4220-2955	Transistor TIP2955	1	
	TR3		

4230-0256	FET M-Type BF256A TR4,6,7	3
4250-0810	FET V-Type MTP8P10 TR9	1
4310-0071	Analogue IC - TL071CP IC24,32	2
4310-0072	Analogue IC - TL072CP IC26,27,29	3
4310-0820	Analogue IC - TBA820M IC31	1
4310-1455	Analogue IC - MC1455 P1 IC6	1
4310-1458	Analogue IC - MC1458 CP IC30	1
4310-6270	Analogue IC - SL 6270C IC25	1
4320-2003	High Current Driver ULN2003 IC8	1
4320-4013	CMOS D-Type Flip-Flop MC14013 IC2	1
4320-4049	CMOS Hex Buffer MC14049 IC7	1
4320-5406	CMOS RS232 Interface MC145406 IC16	1
4321-0000	CMOS Dual and Gate MC74HC00 IC14	1
4321-0002	CMOS Dual Nor Gate MC74HC02 IC15	1
4321-0008	CMOS Dual and Gate MC74HC08 IC19	1
4321-0138	CMOS 1-8 Decoder MC74HC138 IC18	1
4330-0691	Watch Dog I.C. MAX 691CPE IC33	1
4330-6309	CMOS Microprocessor MC63BO9P IC10	1
4330-6321	CMOS Microprocessor MC63B21P IC21	1
4330-6522	Microprocessor - R65C22 AP IC9	1
4330-6551	CMOS RS232 Controller MD65SC51 IC17	1
4330-7170	CMOS Real Time Clock ICM7170 IC13	1
4340-2256	CMOS Memory HM62256LP IC12	1
4340-7128	CMOS EProm HM27C128 IC11	1
4350-4960	Regulator Switch Mode L4960	2

	IC3,5	
4360-0317	Voltage Regulator LM 317T	1
	IC4	
4360-7004	A/D Converter uPD7004	1
	IC22	
4360-7118	Digital Audio Attenuator AD7118KN	1
	IC23	
4360-7905	Voltage Regulator MC 79L05	1
	IC20	
4370-0212	Analogue Switch DG212	1
	IC28	
4510-0032	Crystal Micro Watch 32.768kHz	1
	XTL2	
4510-0184	Crystal Micro H18U 1.843MHz	1
	XTL3	
4510-0800	Crystal Micro H18U 8MHz	1
	XTL1	
5212-1010	Harwin Wafer 10 Way	2
	PL2,PL6	
5313-0020	IDC Straight PCB Box Header 20 way	1
	PL4	
5328-0032	DIN41612 Indirect 32way Female	1
	PL5	
5344-0034	34way Pin Header right angle	1
5354-0025	M50 'D' Connector Plastic 25way Female	1
	PL3	
5404-2010	Jack Socket 1/4 in Mono P.C.B.	1
	PL7	
5650-0250	Spade Crimp size 250	1
	Signal Return	
5910-0016	IC Socket Turn Pin 16 way	2
	IC7,8	
5910-0024	IC Socket Turn Pin 24 way	1
	IC13	
5910-0028	IC Socket Turn Pin 28 way	3
	IC11,12,17	
5910-0040	IC Socket Turn Pin 40 way	3
	IC9,10,21	
5910-1028	IC Socket Turn Pin 14 way strip	2
	IC22 (issued as 2 strips of 14 ways)	
6610-0220	Heatsink TO220 PCB Upright	2
	IC3,5	
6610-0221	Heatsink T0220 High Efficiency	1
	IC 4	
7000-1000	Wire 7/0.2 Single Black	355
7000-3000	Wire 7/0.2 Single Red	255
7000-9000	Wire 7/0.2 Single Grey	90
7072-0032	Heatshrink Tube 3.2mm diam.	30

7124-1300	Nut Stainless Full M3	7
7126-1300	Washer Stainless Plain M3	7
7151-1308	Screw Stainless PAN M3x8mm	5
7151-1310	Screw Stainless PAN M3x10mm	2
7157-1300	M3 Shakeproof Washer	7
7159-6032	M3 Nylon Washer	4
7400-0001	Tyrap short Type PLT1M	1
7500-0220	Transistor Mounting Kit T0 220 IC3,4,5	3
9020-4220	Lithium Battery 40LH220 BP4,5	2

0261-8202 DISPLAY PCB ASSEMBLY

0211-8402	Display Ribbon Cable Assy PL 1	1
0260-2002	Display PCB	1
1101-0101	Resistor LR1 1% 100R R2,3,4,5	4
1101-0103	Resistor LR1 1% 10K R6,7	2
1101-0105	Resistor LR1 1% 1MO R1	1
1101-0181	Resistor LR1 1% 180R RP1	7
1101-0560	Resistor LR1 1% 56R RP3	7
1500-0103	Resistor Network SIL 10K RP1	1
2230-0107	Electrolytic 100uF 16V 509D C1	1
2870-0104	Ceramic Radial 100nF 100V C2	1
4120-4148	Diode 1N4148 D1,2,3,4	4
4220-0751	Transistor ZTX 751 TR1,2,3,4,5,6,7	7
4320-2003	High Current Driver ULN2003 IC1,2	2
4320-4028	CMOS 1-of-10 Decoder MC14028 IC3	1
4350-0293	Stepper Motor Driver L293B IC4	1
4410-2965	LED Single Red/Yellow HLMP 2965 LED 12	1
4410-4124	Led Single Green HLMP-T500 LED 1	1
4420-5601	LED 7-Segment HDSP 5601 LED 2,3,4,5	4
4420-5701	LED 7-Segment HDSP 5701	3

	LED 9,10,11	
6120-0001	PCB Mount Switch SW1,2,3,4	4

0260-8203 E.C.G PCB ASSEMBLY

0260-2001	PCB Issue 6	1
1101-0100	Resistor LR1 1% 10R R49,50	2
1101-0101	Resistor LR1 1% 100R R14,37,58,59	4
1101-0102	Resistor LR1 1% 1K0 R25,29,35,36,44,46,61,65,66	9
1101-0103	Resistor LR1 1% 10K R6,13,15,16,17,77,80	7
1101-0104	Resistor LR1 1% 100K R22,43	2
1101-0105	Resistor LR1 1% 1M0 R72,73	2
1101-0123	Resistor LR1 1% 12K R18,20	2
1101-0153	Resistor LR1 1% 15K R75,78,79	3
1101-0156	Resistor LR1 1% 15M R47,48,68,70	4
1101-0203	Resistor LR1 1% 20K R53,54	2
1101-0204	Resistor LR1 1% 200K R19,21	2
1101-0221	Resistor LR1 1% 220R R74	1
1101-0222	Resistor LR1 1% 2K2 R26,27,30,31	4
1101-0272	Resistor LR1 1% 2K7 R1,4	2
1101-0334	Resistor LR1 1% 330K R10,32,63	3
1101-0432	Resistor LR1 1% 4K3 R9	1
1101-0472	Resistor LR1 1% 4K7 R24,28,45,60	4
1101-0511	Resistor LR1 1% 510R R51	1
1101-0512	Resistor LR1 1% 5K1 R2,5,7,12	4
1101-0514	Resistor LR1 1% 510K R3,8,11	3

1101-0512	Resistor LR1 1% 5K1 R2,5,7,12	4
1101-0562	Resistor LR1 1% 5K6 R76	1
1101-0622	Resistor LR1 1% 6K2 R23	1
1101-0681	Resistor LR1 1% 680R R38,38,40,41	4
1101-0683	Resistor LR 1% 68K R42	1
1101-0684	Resistor LR 1% 680K R33,34	2
1109-0102	Resistor H8 0.1% 1K0 R56,57	2
1109-0103	Resistor H8 0.1% 10K R52,69	2
1109-4752	Resistor H8 0.1% 4K75 R62,64,67,71	4
1109-6041	Resistor H8 0.1% 6K04 R16A	1
1109-6811	Resistor H8 0.1% 6K81 R55	1
1109-7150	Resistor H8 0.1% 715R R16B	1
1430-0101	Multiturn Pot. 100R Type 64Z-100R VR1	1
1430-0501	Multiturn Pot. 500R Type 64Y-500R VR2,VR3	2
1430-0503	Multiturn Pot. 50K Type 64Y-50K VR4	1
2230-0107	Electrolytic 100uF 16V 509D C17,22,23,24,33,34	6
2350-0105	Tantalum 1uF 35V 499D C39,40	2
2564-0228	Polyester 10% 220nF C4,5,11,19	4
2564-0478	Polyester 10% 470nF C28	1
2564-4710	Polyester 10% 4n7 C7	1
2574-0016	Polyester 10% 1uF 63V C1,2,3,10,15,41,42	7
2770-0222	Ceramic Axial 2200pF 50/100V C13,14	2
2870-0103	Ceramic Radial 10nF 100V C18	1
2870-0104	Ceramic Radial 100nF 100V C12,16,21,25,26,27,29,30,31,32,35,36,43,44,45	15
2960-1502	Polystyrene 15nF Axial	2

	C8,9	
2960-3002	Polystyrene 30nF Axial C6	1
3006-0595	Inductor - Radial Ferrite Bead L1,2,3,4	4
4110-0085	Diode BAT85 D1,2,3	3
4140-0051	Diode Zener BZX79B 5V1 2% ZD1,2	2
4140-0056	Diode Zener BZX79 C5V6 ZD4,5	2
4310-0001	Analogue IC - AMP01 FX U11	1
4310-0002	Analogue IC - AMP02 U16	1
4310-0071	Analogue IC - TL071CP U9,10,12,13	4
4310-0072	Analogue IC - TL072CP U2,3,4,5,8,17	6
4310-0077	Analogue IC - OP77GP U14,15	2
4310-0249	Analogue IC - OP249GP U6,7	2
4360-0722	DC/DC Convertor 0722 PSU	1
4361-7805	Voltage Regulator TL780-05C RV1	1
4370-9103	Digital Potentiometer X9103P 10K U1	1
4430-1264	Opto Coupler OPI 1264 C - Optek OP1,2,3,4	4
5212-1010	Harwin Wafer 10 Way PL1	1
5328-0132	DIN 41612 Full Size 2 Row 32 way RA Male PL2	1
7124-1250	Nut Stainless Full M2.5	2
7151-1212	Screw Stainless PAN M2.5x12mm	2
7157-1250	M2.5 Shakeproof Washer	2

SECTION 9

SERVICE INFORMATION

9.1 FETATRACK 210 Service Infomation

This section is designed to record modification detail or service information as it is released from the factory.

ECN Ref NO.	Details	Effective From #

9.2 FETATRACK 260 Service Information

ECN Ref NO.	Details	Effective From #

SECTION 10

DRAWINGS

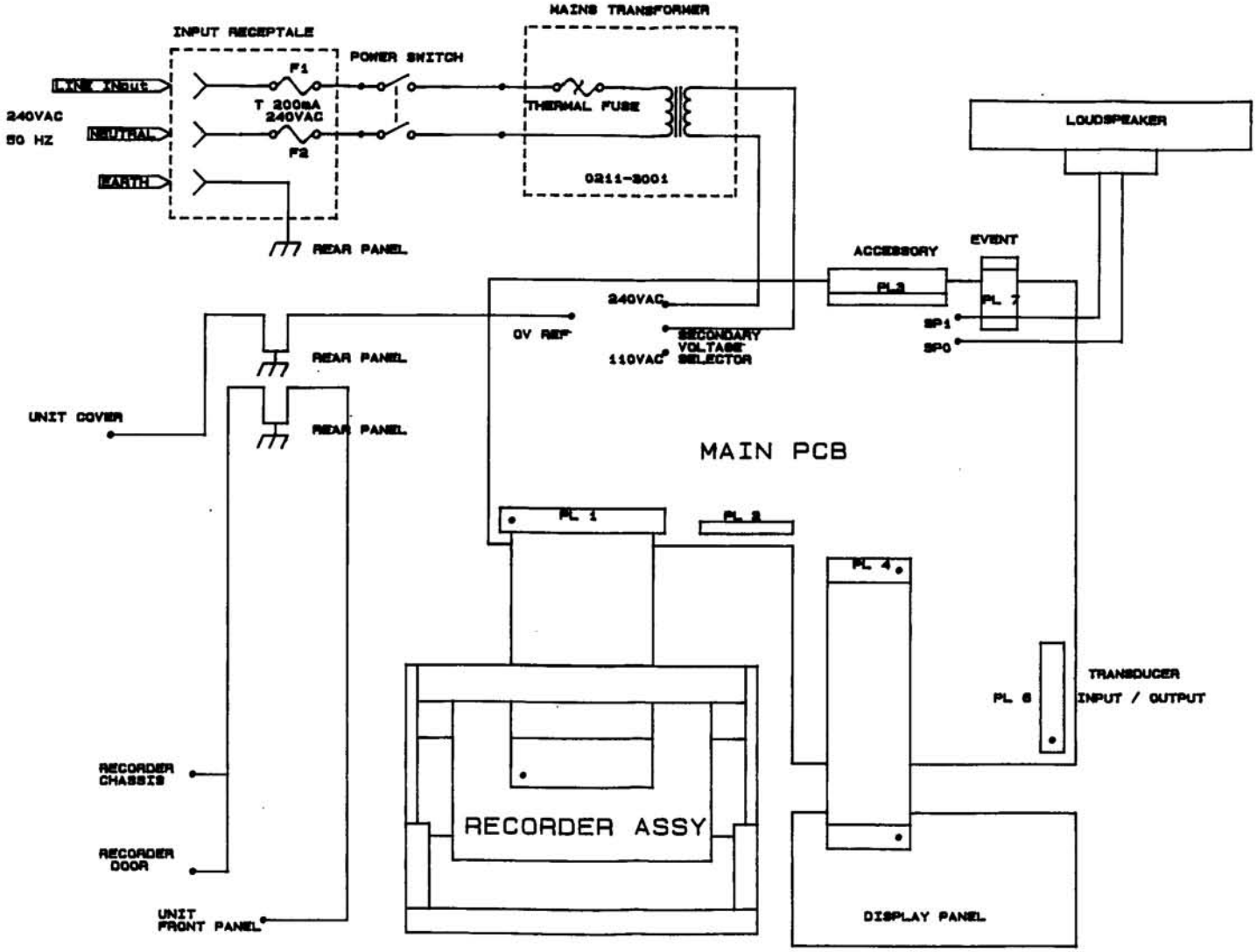
The following drawings and circuit diagrams are included in this section :-

DRAWINGS

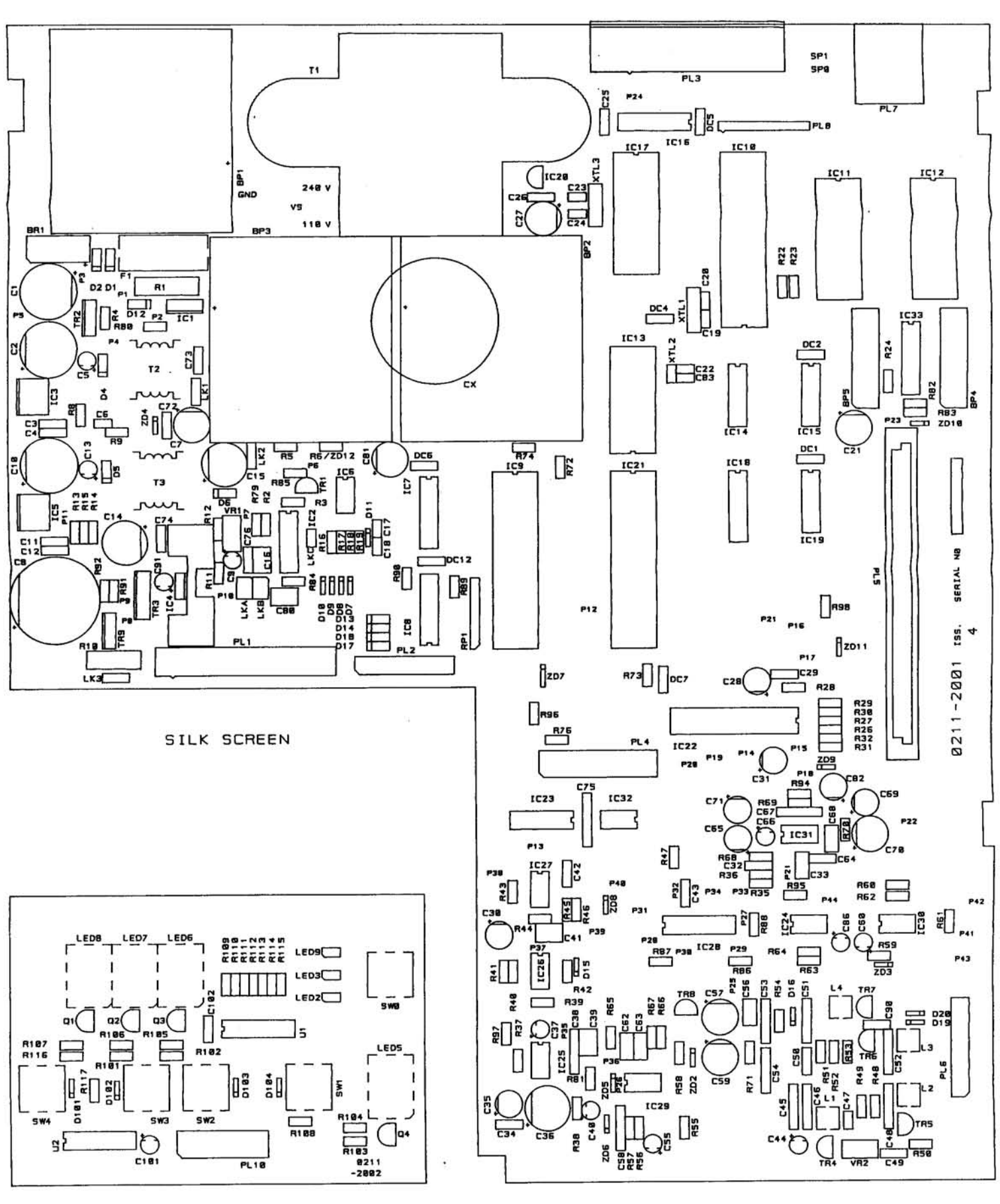
General Assembly Fetatrack 210
General Assembly Fetatrack 260
Recorder Assembly

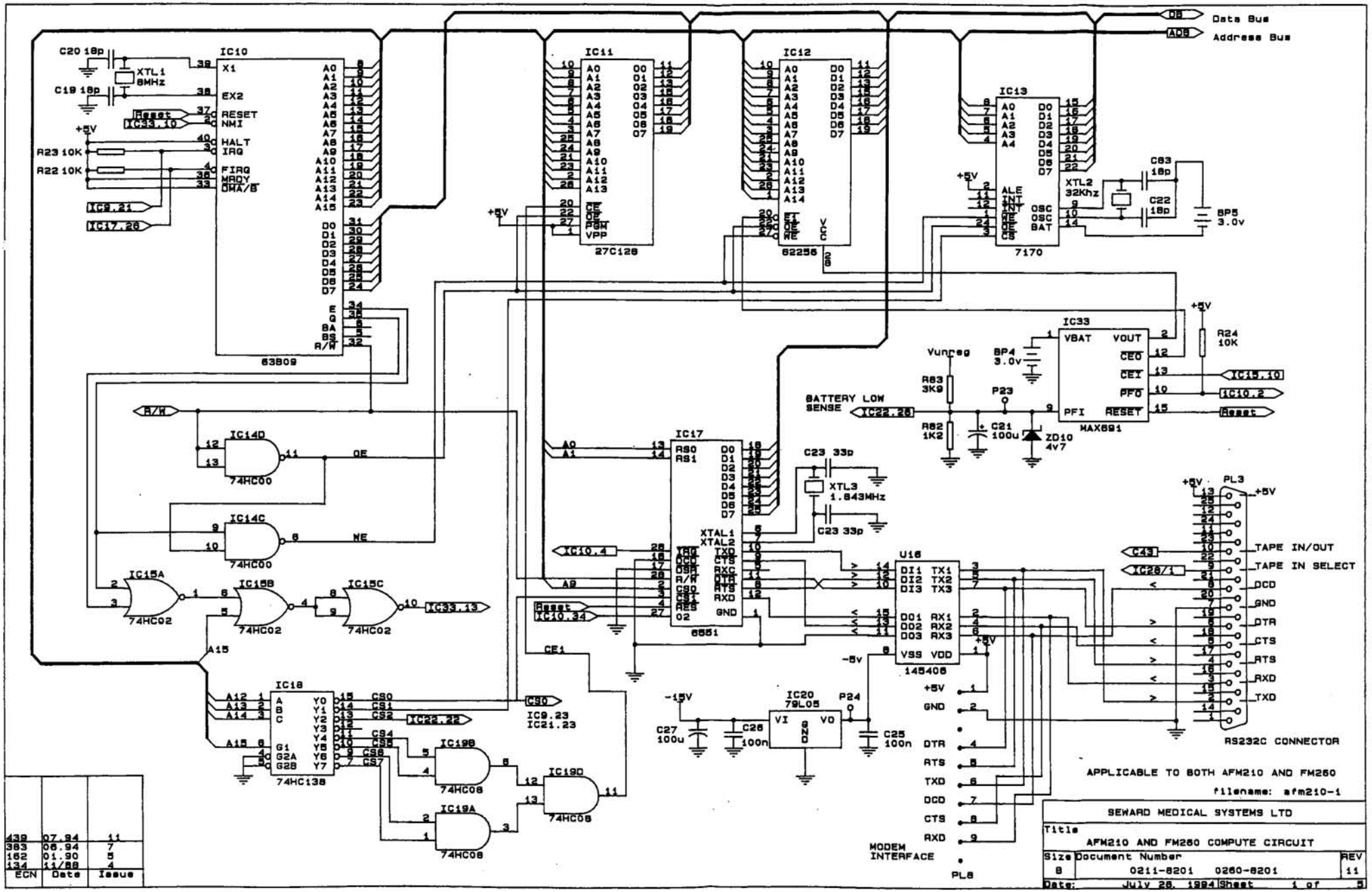
CIRCUIT DIAGRAMS & SCHEMATICS

Interconnection Diagram	0211-0000
Compute Circuit	0211/0260-8201
Input / Output Circuit	0211/0260-8201
Analogue Circuits	0211/0260-8201
Power Supplies FETATRACK 210	0211-8201
Power Supplies FETATRACK 260	0260-8201
Display Circuits	0211-8202
Display Circuits	0260-8202
ECG Circuit	0260-8203
IUP Circuit	0260-8203

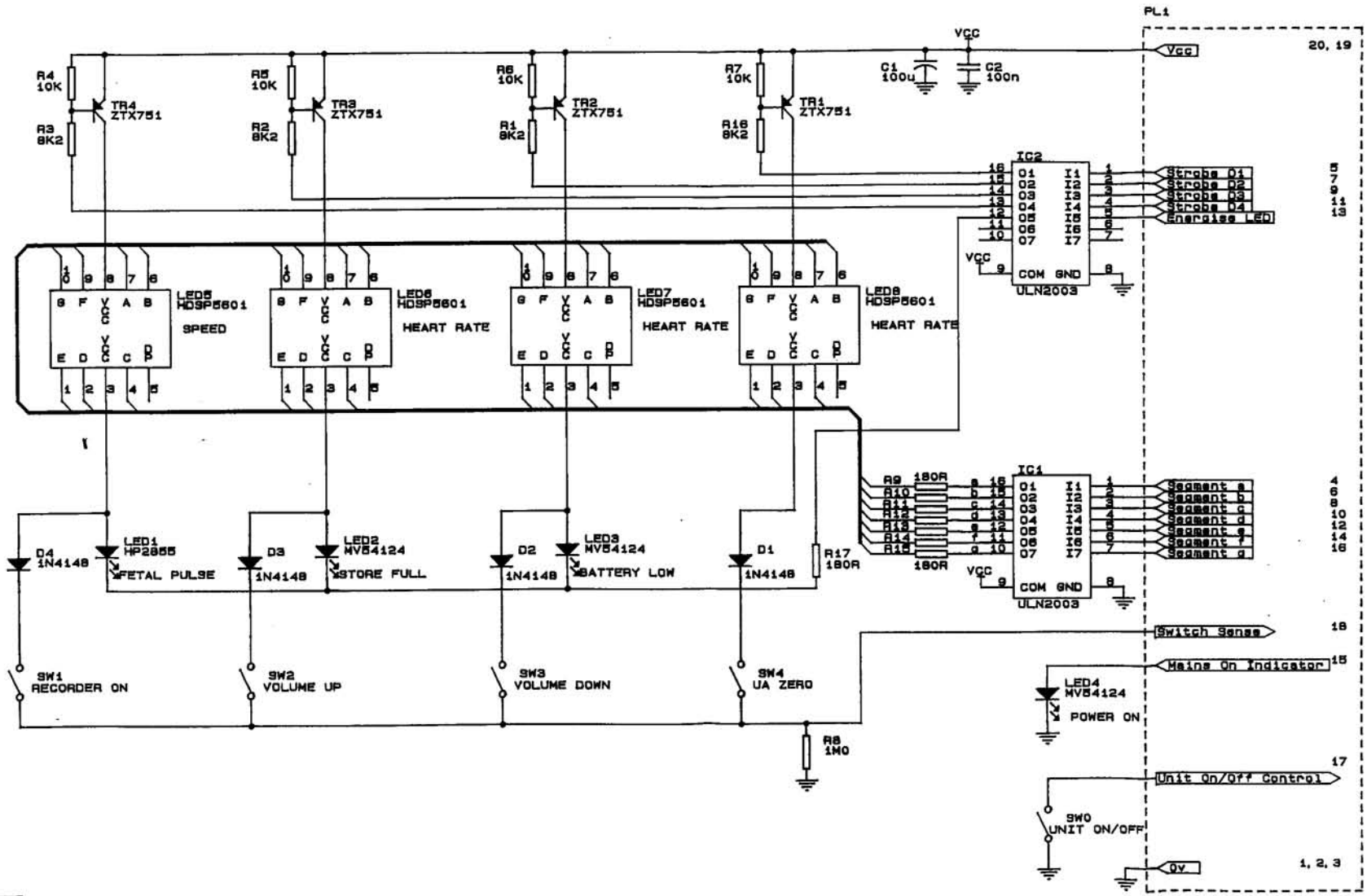


AFM 210 SCHEMATIC		
Size: B	Document Number: 0211-0000	REV: 1
Date: November 13, 1998	Sheet: 1 of 1	


T1
BP1
GND
240 V
VS
110 V
BP3
CX
BP2
SP1
SP0
PL3
PL7
PL8
IC16
IC17
IC18
IC11
IC12
IC20
XTL3
XTL1
XTL2
DC4
DC5
DC2
DC1
IC33
IC13
IC14
IC15
IC19
IC21
BR1
F1
D2 D1
IC1
TR2
T2
T3
IC3
IC5
IC6
IC7
IC8
IC9
VR1
TR1
TR3
IC4
PL1
PL2
LK1
LK2
LK3
LKA
LKB
LKC
RP1
BP5
BP4
ZD10
PL5
SERIAL NO
4
0211-2001 ISS.
SILK SCREEN
PL4
IC22
IC23
IC32
IC31
IC27
IC28
IC26
IC25
IC29
IC24
IC30
ZD9
ZD11
ZD7
DC7
DC12
LED8
LED7
LED6
LED9
LED3
LED2
LED5
SW0
SW1
SW2
SW3
SW4
U1
U2
PL10
0211
-2002

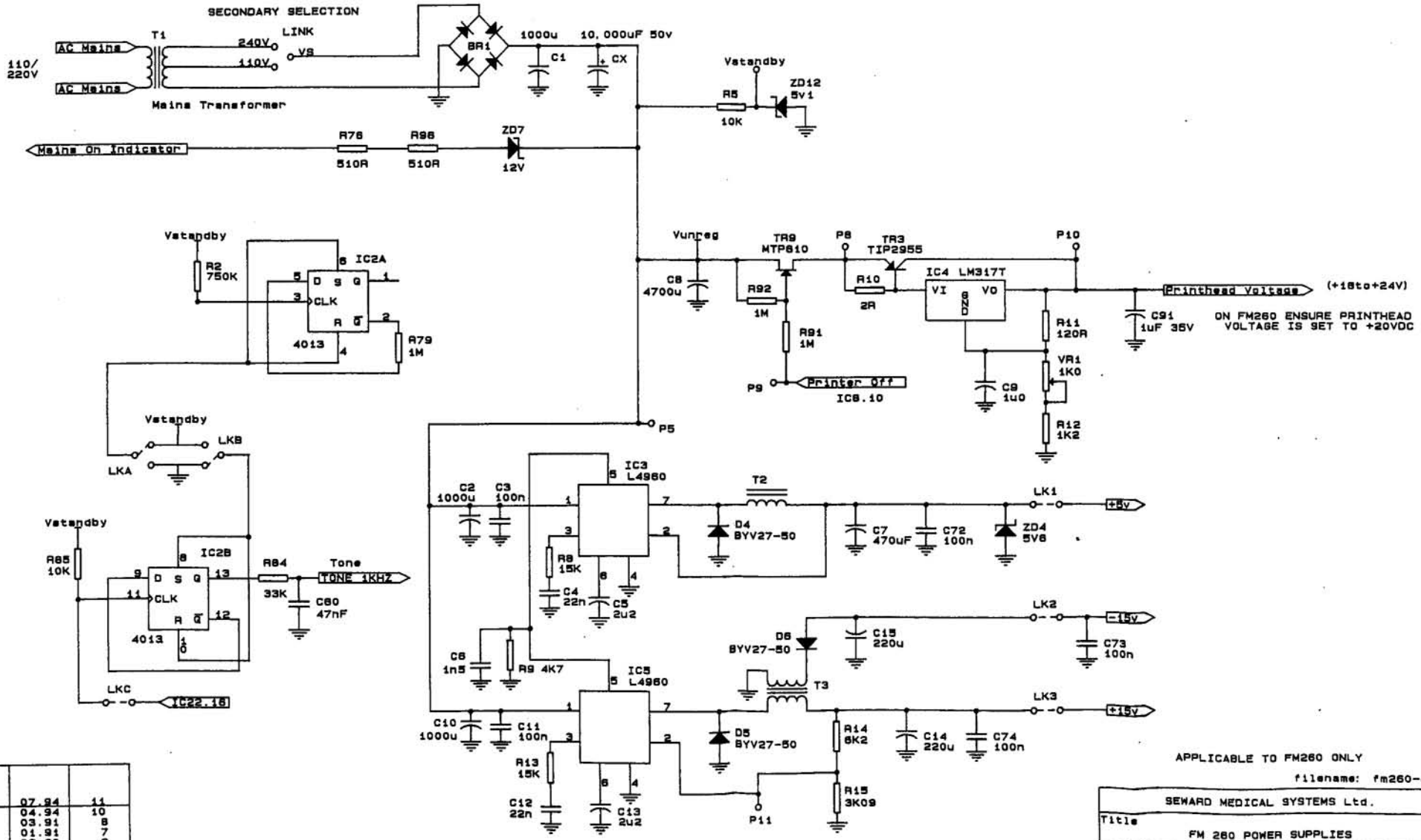


ECN	Date	Issue
439	07.94	11
383	06.94	7
162	01.90	5
134	11/88	4



ECN	Date	Issue
134	11/88	4

Wakeling Medical Ltd		
Title: AFM210 DISPLAY CIRCUIT		
Size: B	Document Number: 0211-8202	REV: 4
Date: February 9, 1990	Sheet 5 of 5	



ECN	Date	Issue
439	07.94	11
422	04.94	10
201	03.91	8
193	01.91	7
165	02.90	6
161	01.90	5
134	11/88	4

APPLICABLE TO FM260 ONLY

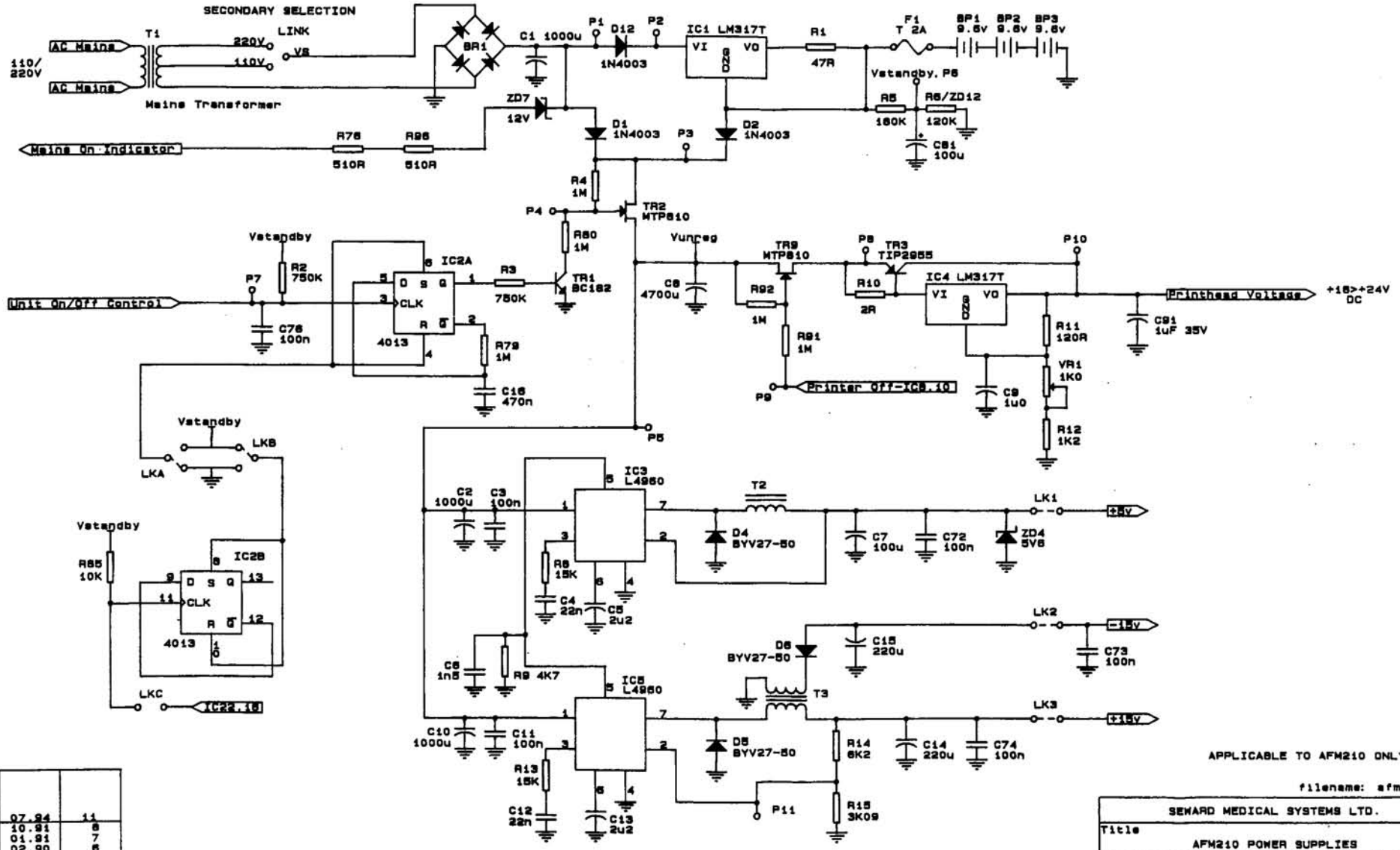
filename: fm260-4

SEWARD MEDICAL SYSTEMS Ltd.

Title: FM 260 POWER SUPPLIES

Size	Document Number	REV
B	0260-6201	11

Date: July 26, 1994 Sheet 4 of 5

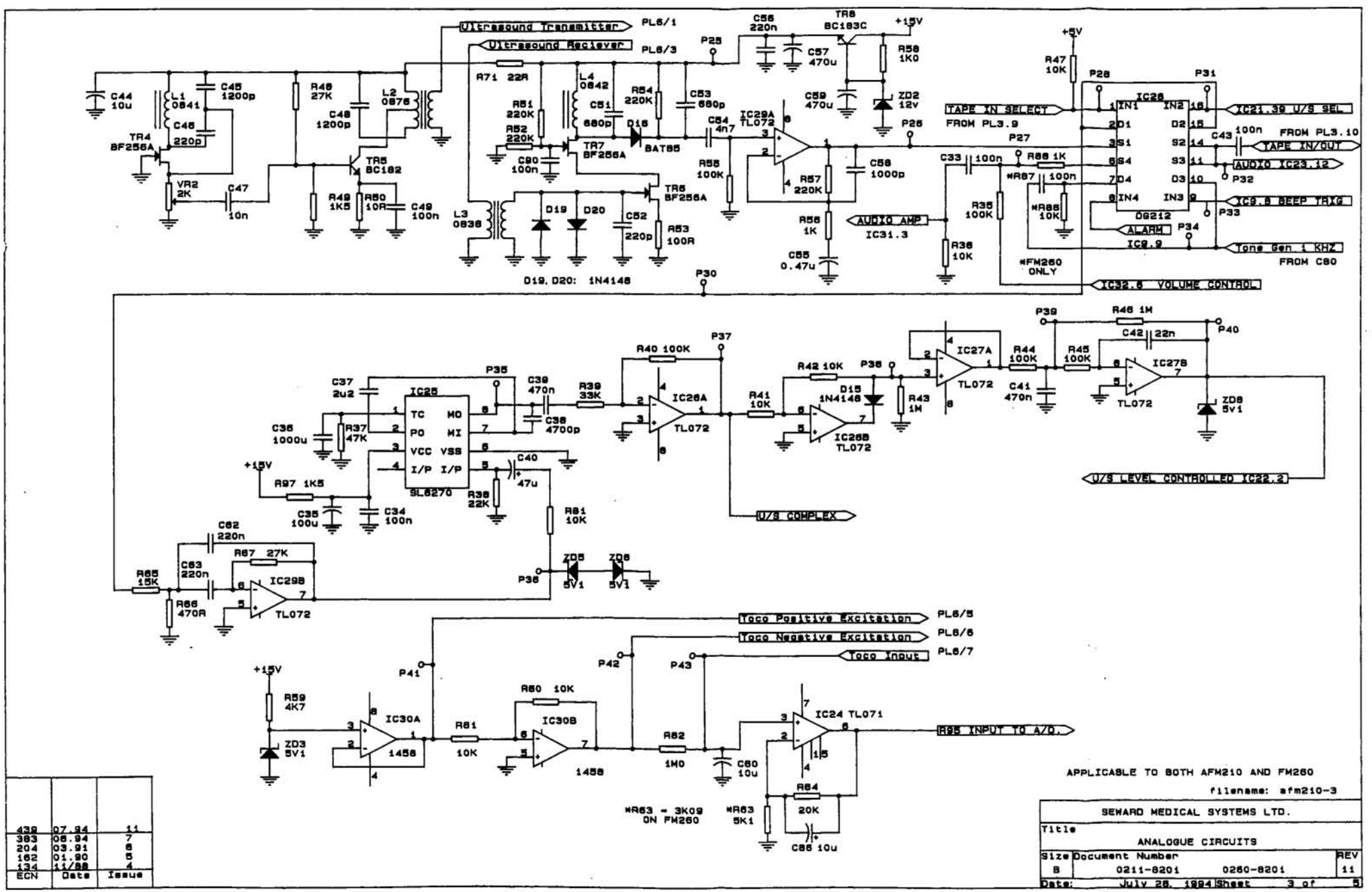


ECN	Date	Issue
439	07.94	11
247	10.91	8
193	01.91	7
164	02.90	6
162	01.90	5
134	11/88	4

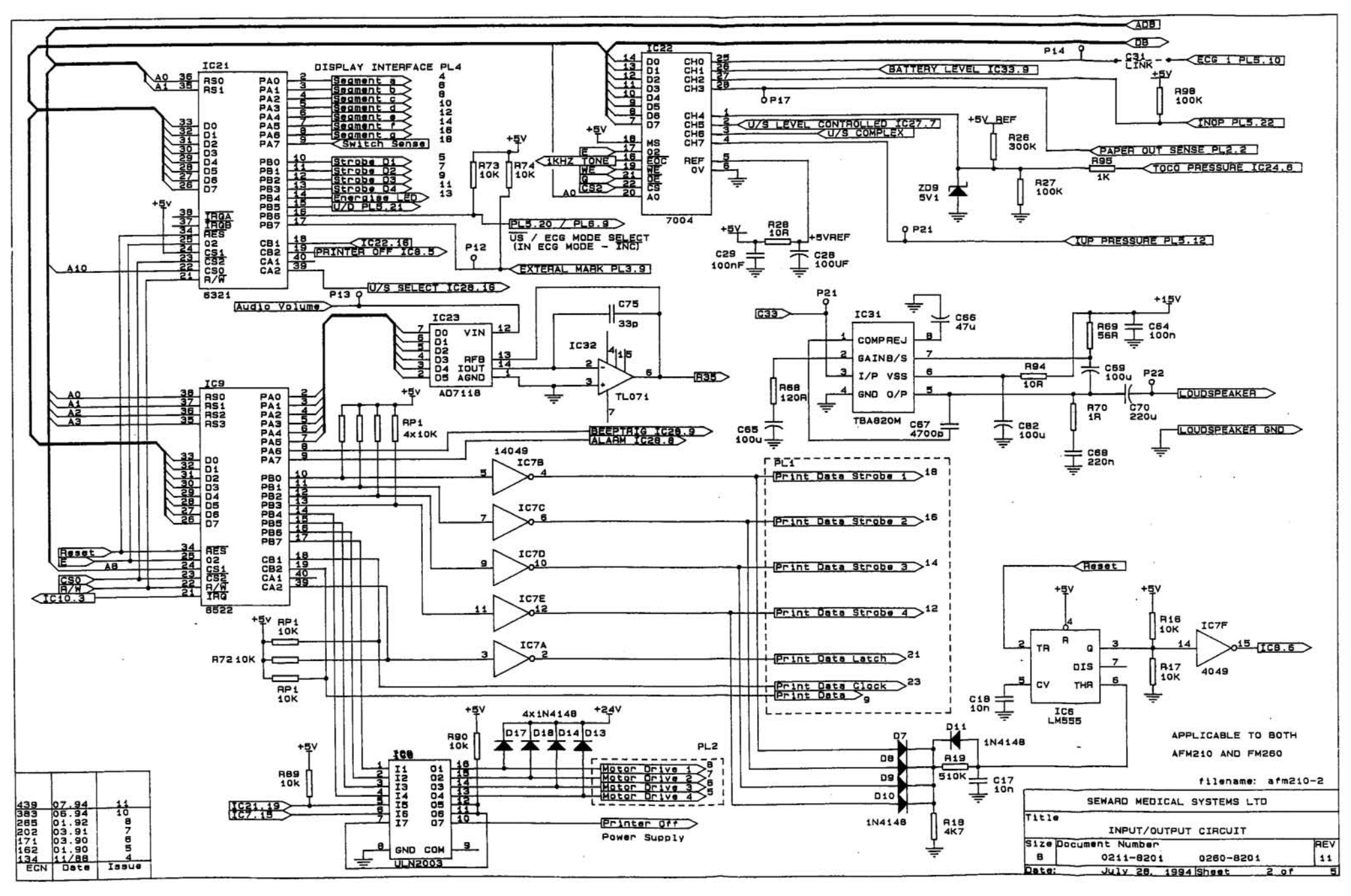
APPLICABLE TO AFM210 ONLY

filename: afm210-4

SEWARD MEDICAL SYSTEMS LTD.		
Title: AFM210 POWER SUPPLIES		
Size: B	Document Number: 0211-6201	REV: 11
Date: July 28, 1994	Sheet 4 of 5	



ECN	Date	Issue
439	07.94	11
383	06.94	7
204	03.91	6
162	01.90	5
134	11/88	4



ECN	Date	Issue
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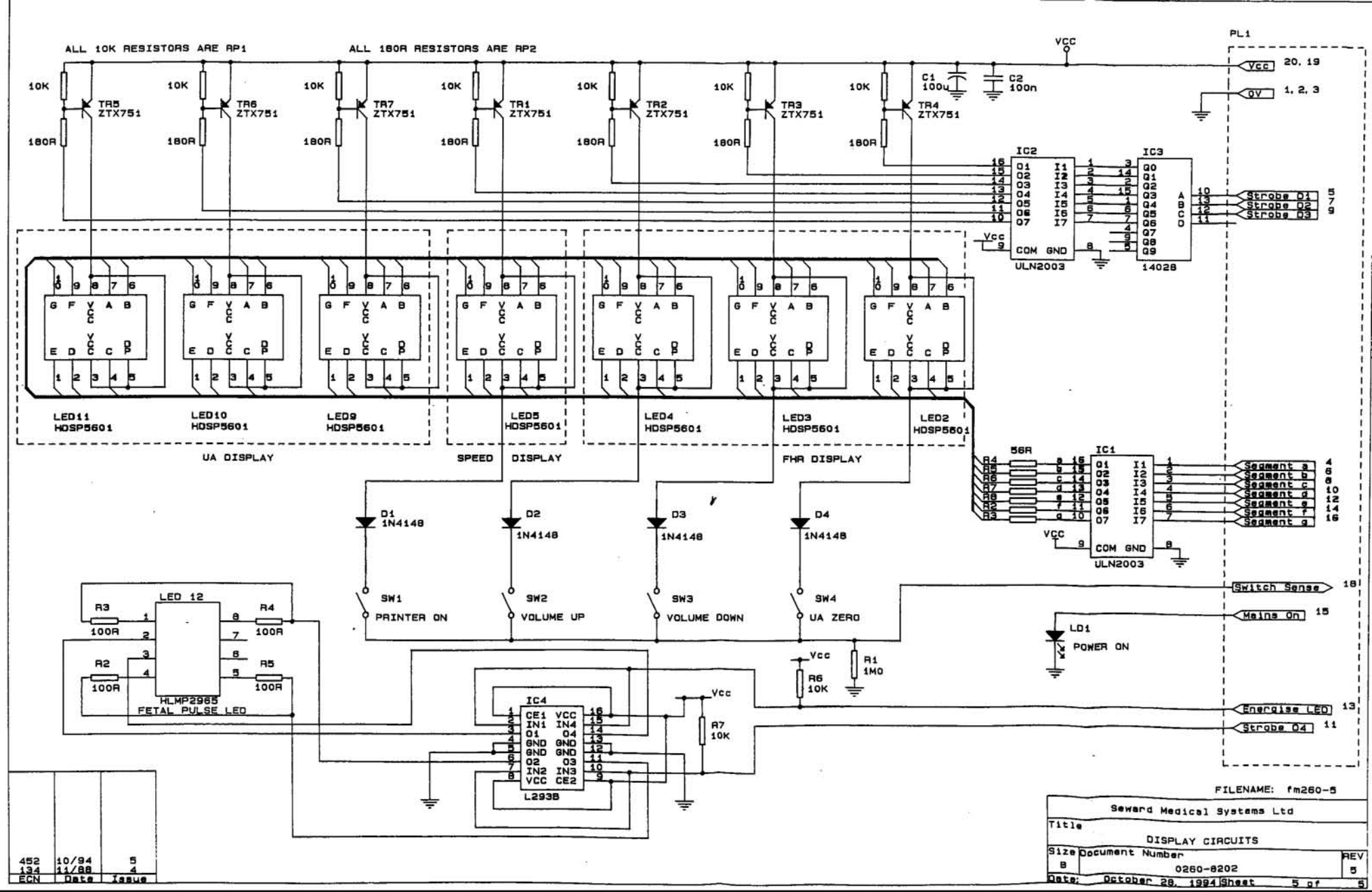
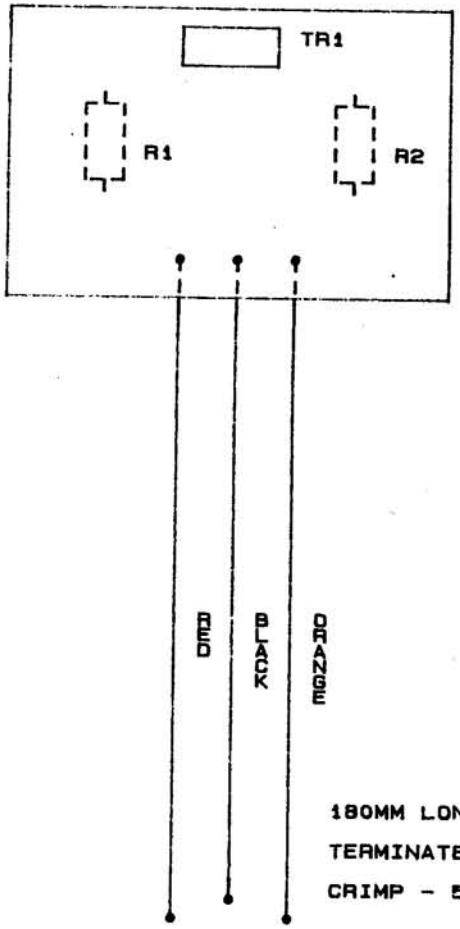
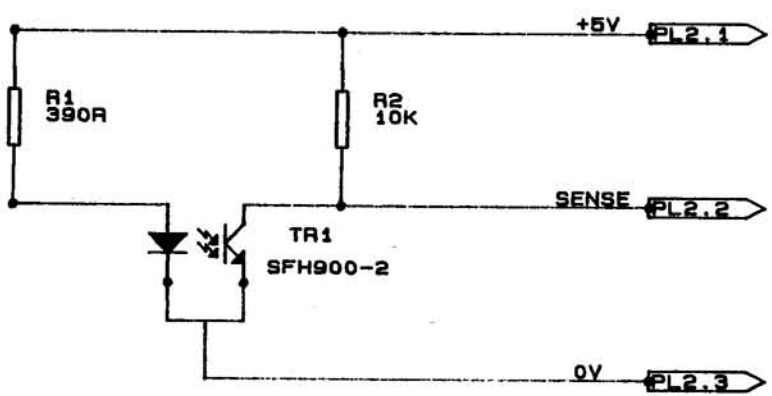
383	06.94	10
285	01.92	8
202	03.91	7
171	03.90	6
162	01.90	5
134	11/88	4

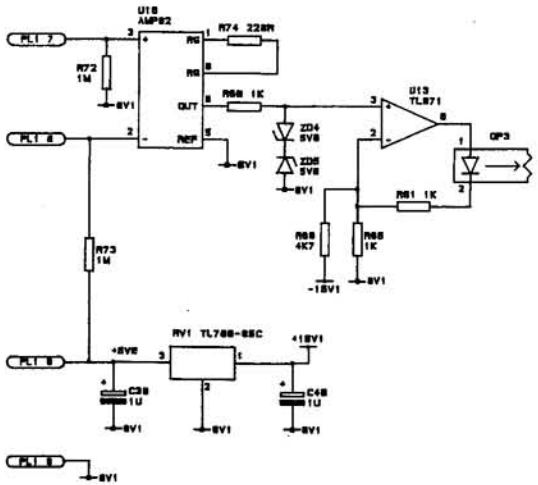

ALL 10K RESISTORS ARE RP1
ALL 180R RESISTORS ARE RP2
TR5 ZTX751
TR6 ZTX751
TR7 ZTX751
TR1 ZTX751
TR2 ZTX751
TR3 ZTX751
TR4 ZTX751
C1 100u
C2 100n
VCC
PL1
Vcc 20, 19
0V 1, 2, 3
IC2
ULN2003
IC3
14028
Strobe 01
Strobe 02
Strobe 03
LED11 HDSP5601
LED10 HDSP5601
LED9 HDSP5601
LED5 HDSP5601
LED4 HDSP5601
LED3 HDSP5601
LED2 HDSP5601
UA DISPLAY
SPEED DISPLAY
FHR DISPLAY
56R
IC1
Segment a
Segment b
Segment c
Segment d
Segment e
Segment f
Segment g
D1 1N4148
D2 1N4148
D3 1N4148
D4 1N4148
SW1 PRINTER ON
SW2 VOLUME UP
SW3 VOLUME DOWN
SW4 UA ZERO
Switch Sense 18
Mains On 15
LD1 POWER ON
R1 1M0
R6 10K
R7 10K
LED 12
R2 100R
R3 100R
R4 100R
R5 100R
HLMP2985 FETAL PULSE LED
IC4
L293B
Energise LED 13
Strobe D4 11
FILENAME: fm260-5
Seward Medical Systems Ltd
Title
DISPLAY CIRCUITS
Size B
Document Number 0260-8202
REV 5
Date: October 28, 1994 Sheet 5 of 5
452 10/94 5
134 11/88 4
ECN Date Issue





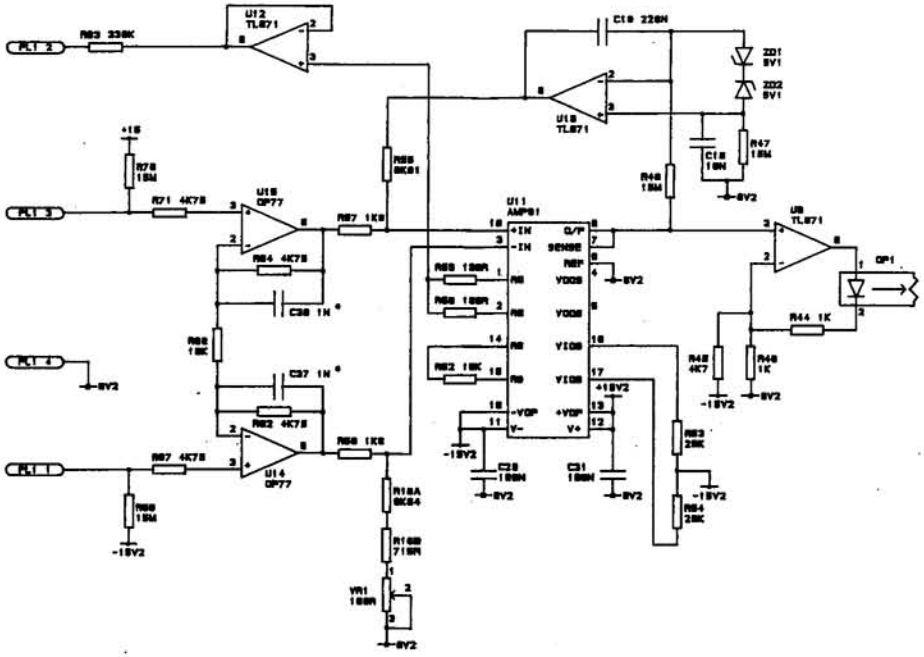
NOTE: TR1 MOUNTED ON UNDERSIDE OF PCB.

SEWARD MEDICAL SYSTEMS LTD.		
Title: PAPER OUT SENSOR		
Size: A	Document Number: 0211-8205	REV: 1
Date: June 9, 1994	Sheet 1 of 1	



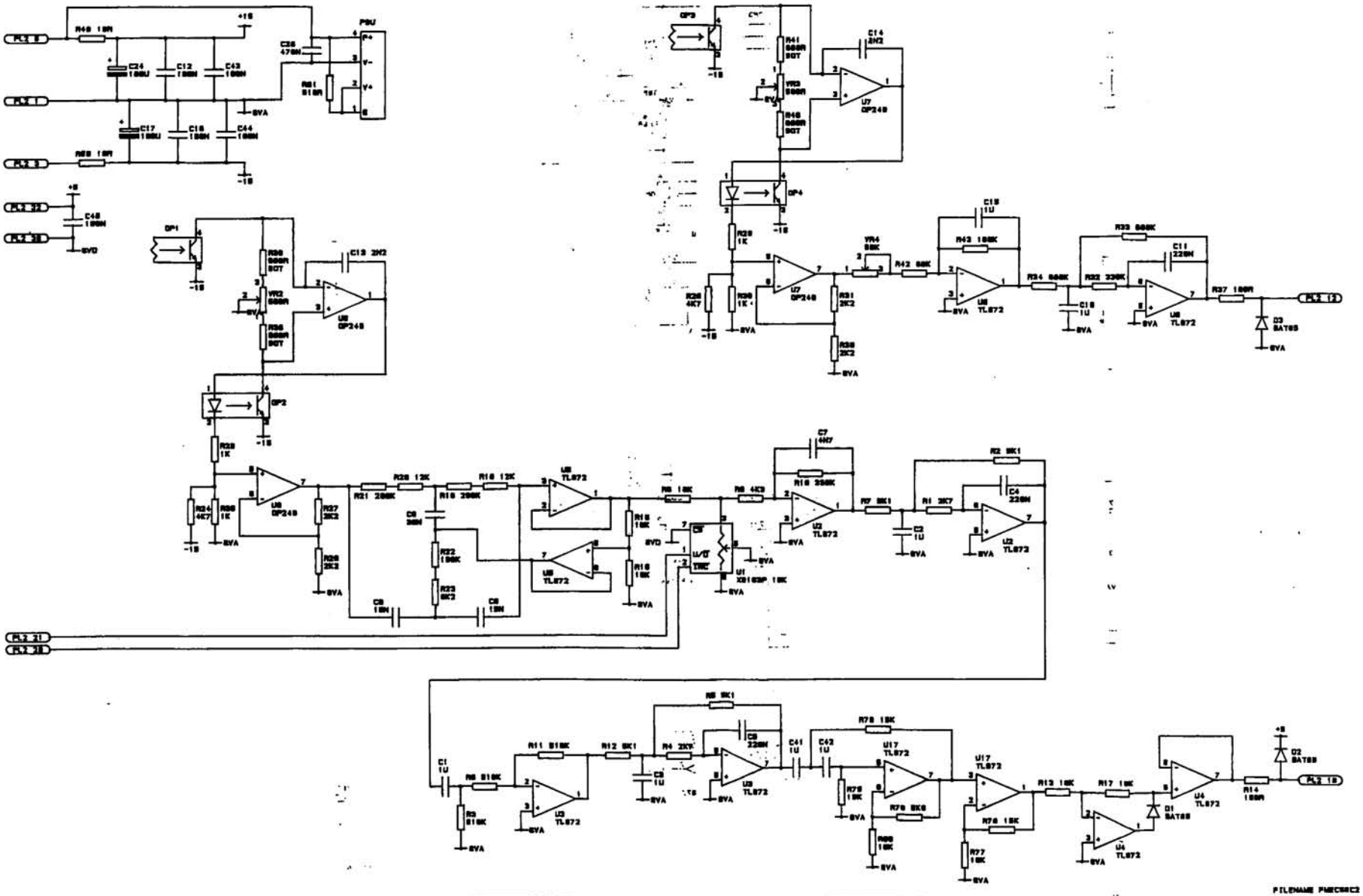
FILENAME PWC0881

DRAWN CREST DATE 15/04/94 CHECKED DATE 19.05.94	COPYRIGHT SEWARD MEDICAL SYSTEMS LTD 1992 LAST COMPONENT USED:-	NOTES:-	ISSUE	DATE	ECN No	DESCRIPTION	ISSUE	DATE	DIS NO.	DESCRIPTION	CIRCUIT DIAGRAM FOR:- IUP INPUT CIRCUIT (ISOLATED) SEWARD MEDICAL SYSTEMS LTD.	DRAWING NUMBER 0260-0203 SH. 2 OF 3
			5	05/01/92		ISSUE 5 PCB						
			6	05/05/92	259							
			7	15/05/92	288							
			8	15/10/92	323							
			9	15/04/94	418	ISS.9 PCB:DRG. AMENDS						



FILENAME PMEC88A1

DRAWN CREST DATE 15/04/94	COPYRIGHT SEWARD MEDICAL SYSTEMS LTD 1992	NOTES:- * C37,38 NOT FITTED	ISSUE	DATE	ECN NO.	DESCRIPTION	ISSUE	DATE	DIS NO.	DESCRIPTION	CIRCUIT DIAGRAM FOR:-	DRAWING NUMBER
	LAST COMPONENT USED:-		9	08/01/92		ISSUE 9 PCB					ECG INPUT CIRCUIT (ISOLATED)	0260-8203
CHECKED DATE 19/05/94			8	08/08/92	288							SH. 1 OF 3
			7	15/08/92	288							
			6	15/10/92	323							
			5	15/04/94	418	189.6 PCB: DRG. AMENDS					SEWARD MEDICAL SYSTEMS LTD.	



FILENAME PWCB#C2

DRAWN	COPYRIGHT	NOTES:-
CREST	SEWARD MEDICAL SYSTEMS LTD. 1992	
DATE 15/04/94	LAST COMPONENT USED:-	
CHECKED		
DATE 19.7.94		

ISSUE	DATE	ECN No	DESCRIPTION	ISSUE	DATE	ECN NO.	DESCRIPTION
5	08/01/92		ISSUE 5 PCB	11	18/7/94	441	R43 TO 68K
6	08/05/92	258					
7	15/05/92	288					
8	15/10/92	323					
9	16/10/92	306					
10	08/04/94	418	ISS.6 PCB: DRG. AMENDS				

CIRCUIT DIAGRAM FOR:-
ECG/IUP PROCESSING (NON-ISOLATED)

DRAWING NUMBER
0260-8203
SH. 3 OF 3

SEWARD MEDICAL SYSTEMS LTD.